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# A STUDY OF PREHISTORIC ANTHROPOLOGY.*

## HAND-BOOK FOR BEGINNERS.

By Thomas Wilson.

Prehistoric anthropology is susceptible of many divisions, each of which is sufficiently extensive to form an independent branch of science, such as the following:

Biology and comparative anatomy.
  Human anatomy.
    Anthropometry, craniometry.
Comparative psychology.
  Literature, language (written, oral, sign).
Industry.
  Materials and implements of every craft.
  Clothing and personal adornment.
  Habitations, and household utensils.
  Weapons.
  Objects for amusement.
  Articles, uses unkown.
Architecture. Fine arts.
  Monuments and public works.
    Roads, trails, canals, irrigating, etc.
    Mounds—sepulchral, effigy, altar.
    Forts and earth-works.
    Graves and cemeteries.
    Idols and temples.

Architecture. Fine arts—Continued.
  Cliff or cave dwellings.
  Towers, ruined or otherwise.
  Engraving.
  Painting.
  Sculpture.
  Ceramics.
  Decoration.
  Ornamentation.
Sociology.
  Love and marriage, child-life.
    Social organizations, customs and beliefs, pastimes.
  Tribal organization.
  Government, property, law, etc.
  Religion, myths, creeds and cults. Folk-lore.
  Education, relief and charities.
  Mortuary customs and furniture.

Short experience in the field will demonstrate the necessity of a knowledge of science, or of certain branches, of even wider scope than those enumerated. Remains of human industry may be found which, insignificant in themselves, derive their value from their geologic horizon. Of this kind may be mentioned the Trenton implements found by Dr. Abbott in the gravel deposits of the Delaware River; the same of the quartz implements found by Miss Babbitt in the terraces of the Mississippi River, at Little Falls, Minn.; the discovery of the remains of a prehistoric fire-place, decided by Professor Gilbert to belong to the

* The imperfections of this fragmentary paper are known to no one better than to the author. It contains nothing new or original, not even the illustrations. No general work on this subject applicable to the United States is easily attainable. Many requests have been received by the author for elementary information. It was found impossible to give satisfactory answers by letter, and this paper has therefore been written as an answer to serve temporary purposes until a more complete work shall have been prepared.—T. W.

quaternary deposits between Lakes Erie and Ontario; and of an obsidian spearhead in the white marl of the Walker River Cañon formed by the fossil Lake Lahontan in northwest Nevada, discovered by Professor McGee; and the paleolithic implements found by Dr. Hilborn T. Cresson, at Claymont, Delaware, and at Upland, Pa.

So also animal remains are frequently found associated with human remains, and therefore some knowledge of zoology is required. The stone implements themselves belonging to the prehistoric peoples require a knowledge of geology and mineralogy to determine their names and the locality from which they come, both of which items may be of great importance.

## THE DISCOVERY OF PREHISTORIC MAN.

Denmark is entitled to the credit of the discovery of the existence of man on earth in the ages before history began. The historic period proper of Scandinavia began about 1000 A. D. But for centuries before that time there had been made, frequently on stone monuments, but also in other ways, runic inscriptions and the poetic legends of the early times of that country, called Sagas. The antiquarians of that country in the past century delighted in studying these Sagas. In this pursuit they discovered Kjokenmoddings, the Danish name for kitchen refuse, the dolmens, the polished stone hatchets, the beautiful flint poignards, and the daggers, knives, spear, and arrow-heads, for which that country has been so justly celebrated. They became impressed with the idea that these belonged to a more ancient race of people than that which had written the Sagas and had erected the runic stones. They were able, by their examination and study, to separate the implements found into three grand divisions, which they designated, respectively, the ages of stone, of bronze, and, lastly, of iron. These ages were found to have endured in these countries for a long period of time and came to a high perfection. Thomson published his memoir in 1836, announcing these discoveries. The conclusions were that the Kjokenmoddings were places of habitation of prehistoric man, or, at least, places occupied by him, and that the shells which formed the heaps were but the refuse from his kitchen. The pieces of flint and bone were his implements, the dolmens were his tombs, and the polished and beautifully-worked flints were but his tools and weapons. They placed his earliest occupation of these countries at from three to four thousand years B. C. and continued it down through the epochs of the different ages until that period when the written history of their country began.

The age of stone, when applied to the Scandinavian countries, refers only to polished stone, for no traces of man's existence in those countries during the paleolithic period have been found. Public attention became attracted to the subject of prehistoric man by Dr. Ferd. Keller in 1853, when he discovered in Lake Zurich the remains of the Swiss Lake dwellers of prehistoric times. He found the same ages of stone,

bronze, and iron as have been found in Scandinavia. Other men took up the investigation, and finally the opening of the canal between Lakes Bienne, Neuchatel, and Morat not only brought to light the great deposit of the iron age at La Tene, but so lowered the waters in the two former lakes as to expose their shores, and to turn loose upon them an army of seekers after the implements of prehistoric man.

In 1859 was developed and acknowledged as genuine the discovery of the paleolithic period, an earlier epoch in the existence of prehistoric man. This was called at first the age of chipped stone, because the implements were chipped or flaked, and not polished. This discovery was made by M. Boucher de Perthes in the valley of the river Somme, France. Thus there were found two kinds of stone implements—the chipped and the polished—and from their respective positions it was concluded that they belonged to two different races of men occupying the country at different and perhaps remote periods of time, in which the earlier chipped the stone to make his implements, while the other had so increased his knowledge as to be able to polish them. These different periods were named by Sir John Lubbock paleolithic, meaning ancient stone; and neolithic, recent stone. From that moment prehistoric anthropology received an impetus proportionate to its importance, and since then has gradually elevated its rank among the sciences.

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Monsieur de Mortillet published "Le Préhistorique," which, with its album of illustrations, has become a standard work for the age of stone in France. He now has in press a work to be called "The Protohistorique or the Aurora of History."

MM. de Quatrefages and Hamy have now under way a work to be entitled "Histoire Générale des Races Humaines," to be published by the ethnologic library, but of which there has, as yet, been issued only the introduction by M. de Quatrefages; and "The Aztecs," by M. Lucien Biart.

Dr. D. G. Brinton, professor of ethnology and archæology in the Academy of Natural Sciences of Philadelphia, has edited the portions of the "Iconographic Encyclopedia" which relate to anthropology, ethnology, and ethnography. The articles on the two former subjects were prepared by Dr. Brinton, and the latter was translated from the German of Georg K. C. Gerland.

"The Prehistoric Times," by Sir John Lubbock, is the most complete work yet published in English.

It would be useless to attempt the mention of every book extant, dealing with the subject of Prehistoric Anthropology. I give only the most prominent works which should be found in almost every public library. From these a choice can be obtained, and with these the student may obtain a fair start in the science.

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The prehistoric ages have been divided in other parts of the world into stone, bronze, and iron, so called from the material principally employed for cutting implements.

## THE STONE AGE.

The stone age has been divided, in Europe, into periods, although scientists are not entirely harmonious therein. The names given, are: Eolithic, or dawn of the stone age; the Paleolithic, or ancient stone; and the Neolithic, or recent stone. The first two are of chipped stone, the last is of polished stone. The first or Eolithic period belongs entirely to the tertiary geologic epoch, and is not accepted by many of the scientists of Europe. I give it a place here because of the possibility of information we may obtain concerning it in America from disputants and investigators. By being thus forewarned they might find implements or evidence in this country which would materially assist in solving the riddle and establish the existence of this period.

## THE EOLITHIC PERIOD.

But little is known concerning this age in any part of the world. But enough has been discovered to justify attention to and a search for its evidences in places where they are likely to occur. The implements will be of the rudest possible form, so much so that their human manufacture has been the subject of much discussion, doubt, and, many times, denial. The materials of which the implements found have been made are usually flint or chert, but there is no reason why the man of that period, if he had an existence, may not have used any stone which was capable of being chipped.

It is possible that bone or shell may have been used for implements, and fossil specimens may be found bearing evidence of human workmanship. While no such instance has been recognized, yet the objects are worthy of attention. Fossilized human remains might also be found. Some examples are declared to have been discovered in Europe and in South America, not to mention the contention over the Calaveras skull.

The man of this age is claimed to have had an existence during the tertiary geologic period. On this question the world needs enlightenment. This can only be obtained by intelligent observation, accompanied by accuracy of statement, with minute details, as everything depends, in case of the discovery of a piece of evidence, upon the location, situation, and association of the object, which once disturbed from its original position can not be replaced. It is always best to call whatever of scientific aid is obtainable before any removal is made; also as many witnesses as practicable.

The value of human implements or remains will be greatly enhanced if they are found associated with the remains of fossils, especially animals belonging to that period. These should be gathered and reported with all possible detail and the specimens preserved, no matter in what number. In all discoveries of this kind the contention has heretofore been whether the stratum in which the object is found belongs really to the tertiary or to some later geologic formation, and after that whether there has been any subsequent disturbance or intrusion.

By all means do not seek to clean the specimens by scraping or washing, nor even by brushing. The archæologic value of the Calaveras skull was destroyed by this means.

These objects may be sought for in the clays and gravels of the Washington Columbia formation, in the phosphate beds of South Carolina, the coral beds in the lagoons of Florida, and the *equus* beds of Texas and Mexico. It is the contention of some geologists, though disputed by others, that the auriferous gravels of California also belong to the tertiary formation.

## THE PALEOLITHIC PERIOD.

The paleolithic period of the stone age has been subdivided into various epochs, though in these subdivisions and their nomenclature the scientists of Europe are by no means agreed. M. Lartet named the epochs after the animals which have been found associated with the implements and called them, respectively, the epochs of the cave bear, the mammoth, and the reindeer. Monsieur Dupont, of Belgium, divided it only into two and named the epochs after the mammoth and the reindeer. M. de Mortillet has divided it into four epochs and has named them, respectively, the Chellian, after the station of Chelles, a few miles east of Paris; the Moustierian, after the cavern of Moustier on the river Vézère, Dordogne; the Solutian, after the cavern of Solutré near Macon; and the Madelenian, after the cavern or rock shelter of La Madeleine, Dordogne.

In later days the tendency seems to be to divide them otherwise. M. Cartailhac, M. Reinach, following Mr. John Evans, are in favor of the first period being called that of the alluvium and the second that of the caverns. All these gentlemen are, however, unanimous in their agreement that this period and all these epochs, whatever they are to be called, belong to the quartenary geologic period; that they were earlier than the present geologic period, and that they came to an end before its commencement. The most certain, and therefore to me the most satisfactory division, has been that of M. de Mortillet, named after the various localities where the respective implements have been found in their greatest purity. I give my preference to it, but do so subject to the correction incident to further discovery. If for no other reason it is more convenient. The names given are for localities and, consequently, are purely arbitrary. They may not, perhaps, serve for general terms over the world, but within their own locality they have a definite and certain meaning, while to say the epoch of alluvium, the epoch of caverns, the epoch of the drift, or the epoch of the mammoth, bear, reindeer, etc., might have an application in other countries which would deceive the student or reader. The names of Chellian, Moustierian, etc., have no such application, are not possible to be applied to other countries. They mean, then, just one kind of civilization, one kind of implement, and thus we know what is meant when

these terms are used. If other countries have different things to be described, if different epochs are found, then other names may have to be given, but when we speak now of these epochs, the Chellian, Mousterian, etc., and the implements that belong to them, the speaker and hearer are on a common ground in which both understand the same terms used to mean the same thing.

The world is indebted principally to M. Boucher de Perthes for the great discovery of prehistoric man in the paleolethic period. He lived at Abbeville, on the river Somme, about half way between Paris and Calais. In 1841 he found in a sand-bank, then being worked at Menchecourt, a piece of flint rudely fashioned to an edge and point, which excited his attention and wonder, for he asked himself, "How could this stone have taken this form by any other than human intervention?" He continued his investigations at occasional intervals, chiefly in the excavations and fillings at Abbeville and in the gravel which was being removed he found many of the same implements. In the year 1846 was published his first work on the subject, in which he announced his belief that these were human implements and of the same age as the gravels in which they were found. This statement made but few converts; nevertheless, being an enthusiast, and pressing his belief always in season and sometimes, possibly, out of season, came to be regarded as what would now be called a "crank."

Doctor Rigollot, in 1853, was the first to make such examinations of the locality by which, finding the implements *in situ*, he became a believer in the new theory. M. Boucher de Perthes was no exception to the rule that prophets are without honor in their own country. At last, however, the tide turned in his favor, and I can not do better than to quote from Sir John Lubbock, himself one of the actors, his description of the event:

> In 1859 Dr. Falconer, passing through Abbeville, examined the collection of M. de Perthes, and on his return to England called the attention of Mr. Prestwich, Mr. Evans, and other English geologists to the importance of his discoveries. In consequence the valley of the Somme was visited in 1859 and 1860, firstly by Messrs. Prestwich and Evans, and shortly afterwards by Sir C. Lyell, Sir R. Murchison, Messrs. Busk, Flower, Mylne, Goodwin-Austen, and Galton; Professors Henslow, Ramsay, Rogers; Messrs. H. Christy, Rupert Jones, James Wyatt, myself, and other geologists.

Mr. John Evans, in his "Ancient Stone Implements of Great Britain," describes the same event:

> We examined the local collections of flint implements and the bed in which they were said to have been found, and, in addition to being perfectly satisfied with the evidence adduced as to the nature of the discoveries, we had the crowning satisfaction of seeing one of the worked flints still *in situ* in its undisturbed matrix of gravel, at a depth of 17 feet from the original surface.

The locality was also visited by the French savants who were especially qualified for such a scientific investigation. MM. Mortillet, d'Acy, Gaudry, de Quatrefages, Lartet, Collomb, Hebert, de Verneuil, and G.

Pouchet. Dr. Gosse, of Geneva, was also an earnest and ardent investigator. Mr. John Evans says:

> Indeed it turned out, on examination, that more than one such discovery had already been recorded, and that flint implements of similar types to those of Abbeville and Amiens had been found in the gravels of London at the close of the seventeenth century, and in the brick earth of Hoxne, in Suffolk, at the close of the eighteenth, and were still preserved in the British Museum and in that of the Society of Antiquaries.

The name "paleolithic" was given to this period by Sir John Lubbock. It is composed of two Greek words signifying ancient stone. Belonging to the stone age, all its cutting implements were, of course, of stone. The method of manufacture was by chipping, and all cutting edges or points were thus made. The man of this period seems not to have known, at least never employed, the method of smoothing or sharpening a stone by rubbing it against or upon another. Bone and horn implements were also made during this period, and in its latter part were apparently greater in numbers than the stone.

This period belongs entirely to the quaternary (pleistocene) geologic period, and is assumed to have been contemporaneous, in Europe at least, with the formation of the river valleys and the deposit of the gravels therein. The climate of the first epoch is supposed to have been warm and moist; that it afterwards grew cold, and man in Western Europe sought the caves for protection. It is believed by many this period of cold corresponds with the glacial epoch of that country.

The fauna of the first epoch was composed principally of animals which were extinct before our earliest knowledge of natural history. The *Elephas antiquus*, a pachyderm, the ancestor of the elephant tribe; *Rhinoceros Merckii*, *Trogontherium*, a large beaver, have been found at Chelles, associated with implements of human industry.

These animals are now all fossil. They belong to the quaternary geologic period, and have never been seen or known in the present day. They have been found in many other prehistoric stations associated with the Chellian implements of human manufacture. Here was the beginning of human art. This was the first art product.

The foregoing sentence might be easily overlooked. Its importance is largely out of proportion with the space which it occupies, for it tells the story that man existed in that country contemporaneous with these animals, and in a geologic period so much older than the present that one can scarcely imagine man's antiquity as having any relation thereto. The succeeding epochs were more like that of the present. The mammoth came first, and after it the reindeer. One can obtain a faint idea of the time by considering that the reindeer which occupied Southern France in probably greater numbers than it now does in Lapland, was the animal on which the prehistoric man of this epoch in that country relied principally for his food. A study of the fauna of that period in southern France, as compared with that of the present, shows that there were eighteen species of animals, then

occupying that country, which in the present time have immigrated to the colder regions. Thirteen of them have gone to the north, by degrees of latitude, while five, like the chamois, mountain goat, etc., have retreated to the mountains in search of that cold which was necessary to support their lives, and which they did not find in the subsequent warm climate of southern France.

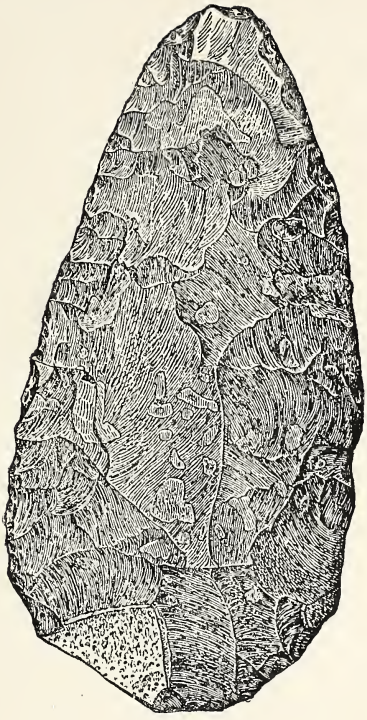
## THE CHELLIAN EPOCH.

The Chellian implements here figured are the standard ones for this period, though they were mostly almond-shaped or oval, with the cutting edge to the point, which is the contrary to those of the neolithic period. The body of the implement was thick, after the shape of an almond or peach stone. It was not thin and flat like those of the later epoch, the Solutrian, and the two are not to be confounded. They are made of flint where that stone was obtainable; where it was not, quartz and quartzite seems to have been employed, although any stone would serve which was homogeneous, so that it might be flaked in every direction; tough, that it might hold an edge, and hard, that it would not break or crumble. The flint always broke under a blow with a conchoidal fracture, and this may be frequently seen.

These implements differ somewhat in form and size, though they are substantially the same. Some of them are more round; others more pointed. A few approach the disk form, and have an edge which might have served for scraping rather than cutting; but all we know of this is obtained from an examination of the object itself. They were all made by chipping, and were usually brought to an edge by the removal of smaller and finer flakes. Chips, flakes, spawls, etc., the débris of manufacture, are frequently found in the deposits associated with finished implements. Many, indeed most of the specimens, show signs of use. Some are broken and others apparently unfinished.

Occasionally the cutting edge extends nearly around the implement, but many times a portion of the pebble is left for a grip. So, while it is possible it may have been attached to a handle in some cases, it is evident that sometimes it was intended to be taken in the hand. The hand may have been protected against the sharp ones by a bit of skin, fur, grass, or other substance. I much doubt whether any of them were attached to a handle, for it must have been with great care and labor that the workman was able to bring them to this sharp edge all around, and when so done it produced a form of implement very difficult to successfully insert in a handle. To make a firm attachment the handle must envelop it at its greatest diameter, and herein lies the difficulty. If the sharpened implement be only partially inserted, a few hard blows would split the handle; if it be inserted too far the same blow will drive it through. Plate LXXXVII, Figs. 1–2.

The flint of which these implements are made has, in many specimens, passed, since their manufacture, through certain chemical and



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2 ½

PALEOLITHIC IMPLEMENTS.

FIG. 1. Chellian implement (flint); from St. Acheul, France.
FIG. 2. Chellian implement (quartzite); from India.

physical changes on their surface. Some show a brilliancy called patine; in some the color has changed to red and yellow, and so on through the scale to chalky white. This change is produced by contact with the atmosphere or earth, or by the contact of water which has percolated through the various earths in the neighborhood, generally those containing iron, and has changed the chemical combination of the flint on its surface. This change sometimes extends deep into the stone, and in small specimens may pass entirely through it. In the United States all this might be called weathering; in France it is called patine. The objection to the former word is that it conveys, possibly involuntarily, some relation to the weather, while the patine may be formed on a specimen deep in the earth.

Dendrites are also formed on the specimens. These changes are all evidences of antiquity of the specimen, and to the experienced eye become testimonials of its genuineness.

The use of the Chellian implement is unknown. The wise men of Europe have made many guesses and suppositions, but these are at best nothing more than speculation. Many of them bear undoubted traces of use on their edges. Mr. John Evans in his latest work reverts to his first and original opinion, "That it is nearly useless to speculate as to the purposes to which they were applied." Sir John Lubbock says, "Almost as well might we ask to what would they not be applied. Infinite as are our instruments, who would attempt even at present to say what was the use of a knife? But the primitive savage had no such choice of tools. We see before us, perhaps, the whole contents of his workshop, and with these weapons, rude as they seem to us, he may have cut down trees, scooped them out into canoes, grubbed up roots, kill animals and enemies, cut up his food, made holes in winter through the ice, prepared firewood," etc.*

The implements of the Chellian epoch are found substantially all over the world. This would indicate, if it does not prove, the expansion of that civilization, and the duration of that epoch to have been much greater than has ever heretofore been supposed. Those from Great Britain are found only in the eastern and southern portion, from Norfolk around to Devonshire and Land's End. They have been found in every quarter of France and southern Belgium, Italy in all its parts, also in Spain and Portugal. They have not been found in northern England, Scotland, Wales, or northern Ireland. Neither in northern Belgium, or Holland, or in the Scandinavian countries, or that portion of Germany bordering on the Baltic, or in northern Russia. These countries were probably covered at that epoch with glaciers, or possibly by the Great North Sea. Paleolithic implements have been found in Asia, Palestine, in India from Bombay to Calcutta, in Cambodia, Japan, in Africa all along the shores of the Mediterranean, and up the valley of the Nile, and lately in the United States.

* Prehistoric Times, p. 364.

They have been called in England drift implements, because they have been found in the river drifts or deposits. Their position when thus found indicates the same antiquity as the river valleys themselves. There was a time when the rivers filled the valleys from hill to hill, pouring down with a rush and carrying the greatest quantity of water to the sea. In that time the irresistible current eroded the earth, and, if need be, the rock, to make for itself a waterway. As time progressed the water subsided more or less, and the current become slower and less powerful. The sand and gravel which had before been carried out to the sea began to be deposited here and there in this bend and on that point, until the deposit came to the surface of the water and formed what is now the highest terrace. Then the river was narrowed and the terrace became a new river bank. This process was repeated again and again until the river finally retreated to its present bed, and left terraces, sometimes three in number, the first being higher, deeper, and more distant from the river than the others. These are now the marks of the successive stages in the formation of the river valleys.

The sand and gravel deposit of the river at Chelles spreads out and forms the plain of the river valley. It is from 22 to 26 feet in thickness. The sand and gravel rests upon the original chalk, and is about on a level with the highest floods of the river in modern times. These deposits are of different degrees of fineness, and are laid in strata or layers, showing that they were made by the action of water. The strata are not always continuous, and differ in thickness and position, showing that the water had varying currents. There are to be found occasional huge blocks of erratic stone. The sand and gravel is sometimes intercalated by other strata which could not have been laid down at the same time or in corresponding manner. One of these is a stratum of calcareous cement several inches in thickness. In many other places, but nearer the top, are pockets or strata which contain various solutions of iron, the percolating water from which gives the color to the implement heretofore described.

There have been many and great discussions over the formation of these river valleys and the deposits of their sand and gravel. These as to the time, manner of formation, and antiquity. I do not enter into this discussion now. I merely state a fact on which all disputants are agreed: that the implements of human industry belonging to this epoch are found in these river gravels, in positions which indicate their deposit at the time of the original formation and at a distance from the river and depth below the surface which indicates their antiquity to be equal with the first deposit. Whether they were swept down from the springs which formed the headwaters of the river, were dropped on the borders in the near neighborhood, or precisely in what manner they became involved with the sand and gravel in which they are now found, is not only unknown but there has as yet been developed no satisfactory theory.

In seeking to establish the existence of a paleolithic period in America, it has been objected that many of the implements introduced as evidence were found on the surface. In western Europe surface finds are not at all uncommon. The St. Germain Museum, at Paris, exhibits six cases of Chellian implements. In five of them are displayed those from the river gravels, and in one is shown similar implements from the surface. These are distinguished as being from the plateau. (The plateau in this case meaning the surface of high level unaffected by the wash of the water which formed the river.) Mr. Solomon Reinach, curator of that museum, in his catalogue and "*Description Raisonnée*," says, page 84:

> The implements found in the ancient alluvium of the rivers are those which have been used or have been rejected. Sometimes they are water-worn, sometimes altogether new and even unfinished. * * * The implements gathered on the plateau come from the camps or workshops. They are much less interesting than those of the alluvium, not being accompanied by a fauna which can serve for their chronologic classification. * * * As the soil of the plateaus is continually upturned by its cultivation, which has thrown together in the same layers the remains of successive civilizations, so the paleolithic and neolithic instruments are often found on or near the surface mixed with those of the epoch of metal and of modern times.

The plateaux on the surface of which these Chellian implements were found extends largely over the interior of France.

Dr. John Evans, the celebrated prehistoric archæologist of England, and the author of "Ancient Stone Implements of Great Britain," says in that work (page 531), "Not far from Currie Farm I found *on the surface of the ground*, in 1869, a well-marked paleolithic implement, in character and size resembling that of Stud-Hill (Fig. 462), and stained a rich ochreous color." During a visit to Dr. Evans's collection in 1889 the writer saw thirty or more paleolithic implements which had been found *on the surface* in the neighborhood of Ightham, Kent. Mr. B. Harrison has gathered in the same neighborhood nigh six hundred paleolithic implements which are described by Mr. Prestwich in the Quarterly Geologic Journal, No. 178, of May 1, 1889. I quite agree with Mr. Reinach that these surface implements are much less interesting than those found in the river gravels. I agree and have always said that the implements thus found are not proof of the *antiquity* of the paleolithic period. The most I have ever contended was that they were evidence of its *existence*. The paleolithic implements of Europe have been found by the ten thousand in the river gravels at various depths, and associated with the extinct fauna of the Quaternary geologic period. Thus the antiquity of the paleolithic period has been established without the aid of the implements found upon the surface. In the United States this is not the case; therefore the discovery of the paleolithic implements on the surface have a greater relative importance than in Europe. They, however, are evidence only of the existence and not of its antiquity of a paleolithic period. The antiquity remains to be solved by other means.

Enough has been said to demonstrate that the paleolithic implements of this epoch belong to one general type. Their similarity of material, mode of manufacture, and general appearance all testify thereto. While there is this similarity they are not copied one from another. Each one has an individuality, yet they can be recognized as belonging to a common family and having a common origin. In this manner, and for these reasons, a person acquainted with them, or who has had sufficient experience, will be able to recognize a Chellian implement independent of its locality or its associations. This knowledge comes only from experience, but it is the same experience by which the American archæologist recognizes the genuineness of the arrow or spear head, the polished stone hatchet, Indian pipe, and similar objects, and is fairly able to assign them to their proper localities.

The following paragraphs, relating to the differences in form between paleolithic and neolithic implements, may be found of interest:

A glance at the stone implements hitherto discovered in the river drift, whether of England or France, will at once show how different in character they are, as a whole, from those of the neolithic period, excepting, of course, mere flakes, and implements made from them, and simple blocks and hammer-stones. So far as we at present know, not a single implement from the river drift has been sharpened by grinding or polishing, though, of course, it would be unsafe to affirm that such a process was unknown at the time when they were in use. With the unpolished implements of the neolithic period, which most nearly approach those of the paleolithic in form, it will, as a rule, be found that the former are intended for cutting at the broader end, and the latter at the narrow or more pointed end. Even in the nature of the chipping a practiced observer will, in most instances, discern a difference.

When first treating of the character of these instruments (in the Archæologia, now thirteen years ago), I pointed out these differences between the implements of the two periods as being marked and distinct; and though since that time, from our knowledge of the form and character of the stone implements of both periods having been much enlarged, some few exceptions may be made to a too sweeping assertion of the distinctions between the two classes, yet, on the whole, I think they have been fully sustained.

Unground flint implements, with a sharp point and a thick truncated butt, and, in fact, what I have termed tongue-shaped in form, are, for instance, no longer confined to the drift, but have been found by myself, with polished implements, on the shores of Lough Neagh, in Ireland; and yet, though analogous in form, they differ in the character of the workmanship, and in their proportions from those from the gravel. The difference is such that, though possibly a single specimen might pass muster as of paleolithic form, yet a group of three or four would at once strike an experienced eye as presenting other characteristics.

In the same manner some of the roughly chipped specimens from Cissbury and elsewhere—such, for instance, as Fig. 23*—appear to be of the tongue-shaped type, or like other river-drift forms. These are, however, exceptional in character, and as their finding appears to be confined to the sites of manufactories of flint implements, where a very large proportion of the specimens found are merely "wasters" produced in the manufacture, it is doubtful how they are to be regarded as finished tools.

On this subject of the difference in character between the paleolithic and neolithic forms I have been severely taken to task by M. Zinck, in the Proceedings of the Society of Northern Antiquaries of Copenhagen, who has figured several Danish neolithic specimens in juxtaposition with some of my own figures of implements from the drift. In many cases, however, the comparison is made between implements of very

* Ancient Stone Implements, p. 74.

different dimensions, though, by being drawn to different scales, they are made to appear of the same size in the figures; and, in other cases, the specimens engraved are apparently unfinished, or merely wasters thrown away.

But, even granting that these exceptional instances of resemblance can be found, there is no one who can deny that the general *facies* of a collection of implements from the river drift, and one from the surface, is totally and entirely distinct. With regard to the Danish stone antiquities, I think I may safely say that I have as extensive a collection of them as any one out of that country; and, further, that I have more than once examined the collections, both public and private, at Copenhagen, as well as at Stockholm and Lund, and yet that I do not remember to have seen any specimen—unless possibly a mere flake or rough block—which, if placed before me without comment, I should have taken to be paleolithic.

In most cases, even if a similarity of form should be found to exist, there will be a difference in the character of the surface of the material; the deep staining more especially, and the glossy surface so common on the implements from the gravel, being but rarely met with on those from the surface soil.

But, though, on the whole, so widely differing from the implements of the neolithic period, those belonging to paleolithic times show a marvelous correspondence with each other in whatever part of England they are found; and this correspondence extends, in an equal degree, to the implements found in the river gravels of France. In illustration of this, Mr. Flower has engraved, side by side, two implements from Thetford and two from St. Acheul, each pair being almost identical both in shape and size. But what is more remarkable still, this resemblance in form prevails not only with the implements from the river gravels of western Europe, but with those from the laterite beds of southern India. It is true that the material is somewhat different, the Indian implements being formed of compact quartzite instead of flint, and that this circumstance somewhat affects the character of the fracture and facets, but, so far as general form is concerned, they may be said to be identical with those from the European river-drifts.*

## MOUSTIERIAN EPOCH.

This is the commencement of the cavern period. During this epoch and the two succeeding, man inhabited principally the caverns and rock shelters. While I would not assert that the implements and objects belonging to these epochs are not to be found on the surface and otherwheres, yet it is true that the habitations, the workshops, the residences, the fireplaces, hearths, etc., of these three epochs, are to be found principally in the caverns or under the rock shelter. When Monsieur Reinach speaks of the epoch of alluvium, he means the epoch prior to this; when he speaks of the period of the caverns, he means these three epochs following. It is entirely possible that these may have been contemporaneous, that man may have occupied them all at once, to have made and used the implements belonging to these epochs all at one time, and such has been the contention of some eminent scientists. But they are not by any means agreed upon that theory or statement. These subdivisions of the cavern period, made by M. de Mortillet, are Moustierian, the Solutrian, and the Madelenian.

The Moustierian is so named after the Cavern de Moustier, on the river Vézère, Dordogne, France. The typical implements are the

* Evans: Ancient Stone Implements of Great Britain, p. 568.

point and scraper.* The point is different from all other points, in that while one side is left flat and smooth as it was struck from its nucleus, the retouching by which the point and edge are made is all done from the opposite side. The scraper is made in the same way, and its peculiarity is that its edge is upon the side rather than upon the end, as it was in all succeeding epochs. These appear to have been the first scrapers used by the pre-historic man. While the Moustierian implements have been found in the river gravels of Europe, there has been much contention as to their contemporaneity with those of the preceding epoch. But they have been found in the caverns at such depths and with such associations as to cause many pre-historic anthropologists in Europe to believe that they formed a separate epoch, during which the caverns were occupied by the inhabitants for a long period of time. It has been contended that this epoch was, at least in southern France, contemporary with the glacial period. This, if established, would sufficiently account for his occupation of caves and rock shelters. The extinct fauna of the preceding epoch is not found in connection with these implements. The animals become more like those of our own time. This epoch begins what has been called the cavern period.

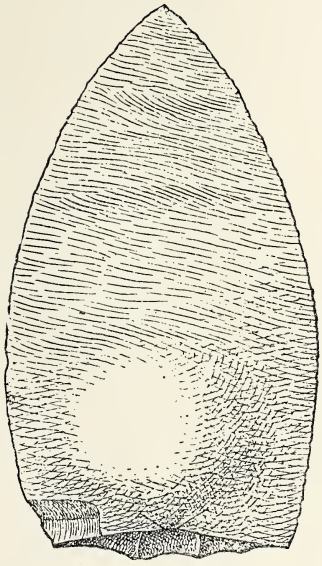
SOLUTRIAN EPOCH.

Is so named after the Cavern of Solutré, near Macon, Sâone et Loire. The Chellian implement had in this epoch ceased to be made; also the one-sided Moustierian point. They were probably replaced by the large and thin spear-head which is shaped like a laurel leaf. The scrapers have been changed in form. They are smaller, and the scraping edge is on the end instead of being upon the side. Knives and saws of flint also appear. The man of this epoch excelled in the art of chipping flint. Indeed, it is doubtful if any subsequent age or epoch even equalled him. The implements are renowed for beauty of form and fineness of finish. It is by this progress that this epoch has become recognized. It is remarkable that these leaf-shaped implements should be found in France in nests or *en cache*, and that great numbers of similar instruments should be found in the United States likewise frequently in nests. It would be exceedingly strange if, upon further study and careful investigation, it should be discovered that the American implements should belong to the same paleolithic epoch, as do those of France.†

Points were also made of bone, sometimes apparently for use in piercing skins, or for sewing garments. Sometimes to replace the chipped flint for spear-points. Another implement peculiar to this epoch was a fine flint-point, apparently a spear, with a tang and shoulder on only one side.

But it is in its art products that this period is remarkable. The Chellian implements and the Moustierian points and scrapers are scarcely fine enough to be worthy of the title of artistic.

* Plate LXXXVIII. † Plate LXXXIV, Figs. 1, 2, 3, 4.



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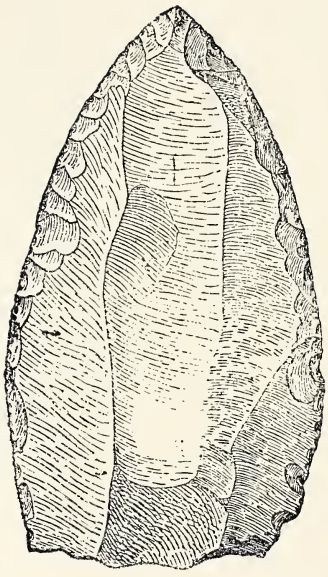

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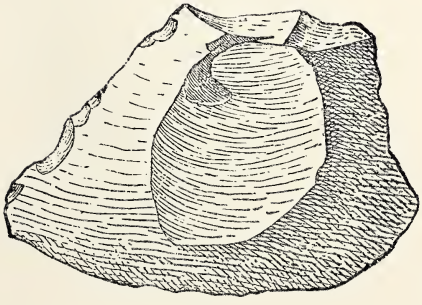

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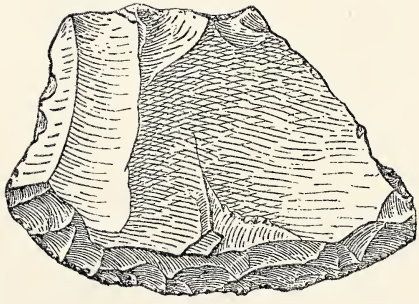

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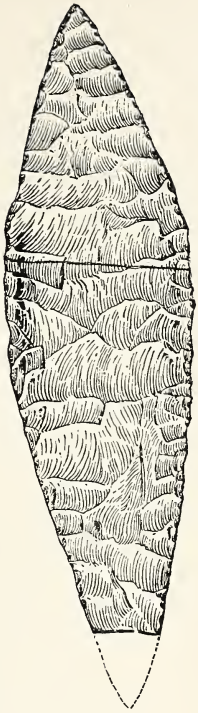
PALEOLITHIC IMPLEMENTS.

FIG. 1. Moustierian point, spear or otherwise (flint); from cavern of Le Moustier.
FIG. 2. Opposite side of Fig. 1.
FIG. 3. Moustierian scraper, showing bulb of percussion (flint); from Chez Pourè.
FIG. 4. Opposite side of Fig. 3.

½ 1



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5
1/1

1/1 6

PALEOLITHIC IMPLEMENTS.

FIG. 1. Solutrian point; shape of laurel leaf. Rigny-sur-Arroux (Saone-et-Loire), France.

FIG. 2. Solutrian point. Grotte de l'Eglise, Dordogne.

FIG. 3. Solutrian point. Grotte de Gargas, Vaucluse.

FIG. 4. Solutrian point. Grotte de l'Eglise, Dordogne.

FIGS. 5 and 6. Solutrian implements, beautifully chipped for spear or other points, with a shoulder on one side. They may have been used for fish spears or harpoons (flint); from Dordogne.

The art of the third period, the Solutrian, was much finer, although confined to the chipping of flint and the making of bone and horn implements. The representative implement of this epoch is the flint spear-head or dagger, which was shaped like the laurel leaf. It was in the working of the flint to make these objects that the best art of the Solutrian epoch is manifested. It may be objected that there was no art required in chipping flint implements, but an inspection of those from the Solutrian epoch, coupled with an attempt on the part of the objector to make one of the larger and finer, will show how far he is from the truth.

An examination and measurement of these implements is required to understand the delicacy of their manufacture. It must have required much education and experience and a large amount of manual dexterity.

Figure 1 represents one of these leaf-shaped points found *en cache* with ten others. It is one of the largest known, and is in the Museum of Chalon-sur-Saone. Its length is 14 inches, its breadth $3\frac{1}{4}$, and its greatest thickness less than three-eighths of an inch. It is made entirely by chipping, which is not either primary or secondary, but appears to be even tertiary. The flakes by which it has been reduced have been struck or pressed off from the edge, and are so long and thin as to resemble shavings rather than chips.

The art of chipping flint attained its highest point during this epoch. It has never been exceeded, and rarely equalled in any time and by any people. The pre-historic people of Scandinavia, in Europe, and those of Mexico and California, in America, are the only ones which have in any way approached it. The modern Indian has chipped his arrow-heads, and many persons of high artistic abilities have, in the interest of science, reproduced them, making them sometimes of flint, obsidian, and even of common bottle-glass. Occasional persons have used their abilities, like "Flint Jack," in making spurious implements to be palmed off as genuine ones. But no flint-knapper of the present day, whether amateur or professional, has yet been able to reproduce one of the fine, Solutrian, leaf-shaped implements. We have had to contend many times with other fraudulent and spurious specimens which evinced a high degree of art and manual dexterity, but never with forgeries or counterfeits of these beautiful implements.

### MADELENIAN EPOCH.

So named from the rock-shelter, La Madelaine, on the Vézère, Dordogne, about half way between Le Moustier and Les Eyzies.

This epoch endured longer than the preceding. Its stations are more frequent; the area more extended; its implements increase in number, variety, and form, and indicate continued progress. While in former epochs the material used by man for the fabrication of his utensils and implements was almost entirely of flint, or at least stone, in

this epoch he used bone, horn, and ivory. He made the long straight flakes of flint in profusion, for his need for knives and saws was naturally great.* Scrapers, gravers, etc., were also of flint (Figs. 1, 3, 4); but piercers or points, needles, harpoons, hooks, and ornaments of divers sorts, were made of bone, horn, or ivory.†

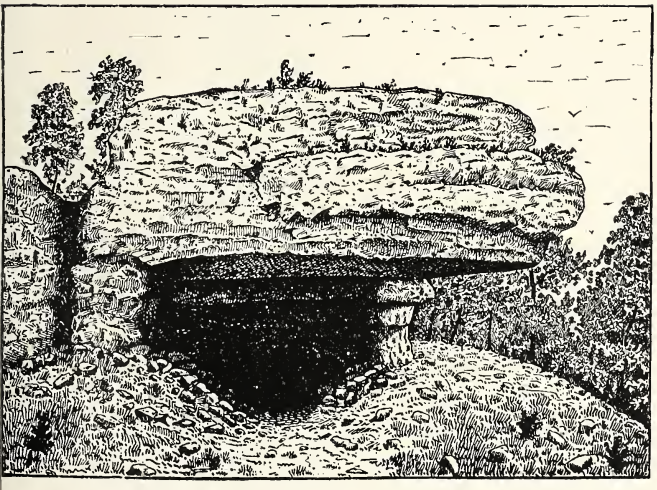
It was in the Madelenian epoch that pre-historic art attained its perfection. The art of that epoch seems to have been indigenous to that country in which its greatest manifestations have been discovered; that is, the Dordogne district of France. It does not seem to have been an imitation, nor to have been borrowed from any other country or people, but only to have been a display of the artistic tendencies of the human mind, and a manifestation of the manual dexterity of that period and locality. It consisted sometimes of sculpture done in the round, sometimes of engravings or etchings on stone, bone, or horn, possibly on wood (though such specimens have decayed), and also the making of the bone and horn implements such as points, harpoons, daggers, needles, etc. The decoration was sometimes of geometric designs made by curved or straight lines, by festoons, zigzag, or herring-bone, or by the same figures made by dots or points.

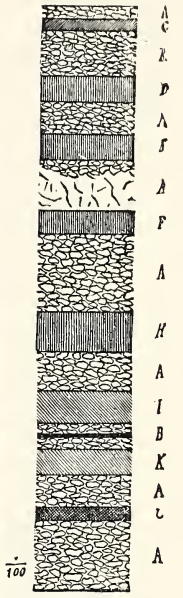
The principal and wonderful manufacture of art in this epoch was the representation of living things. Sometimes the animals represented are at rest, but many times they are in action. Hunting scenes are depicted in which the hunter, a man, is shown in the chase and engaged in active conflict with his game. In one, a man is throwing a spear; in another, the serpent bites his heel;‡ deer in action; the reindeer with his nose high in the air and horns thrown on his back. A reindeer browsing, which represents a veritable landscape with perspective drawing. The engraving and sculpture represent the mammoth, the reindeer, horse, bison, birds, fish, serpent, musk-ox, and others.§ Some of these are Arctic animals now found only in cold countries. Some of these are of animals now extinct. A mammoth is found engraved on a piece of ivory (part of his own tusk), a cave-bear was engraved on a flat stone of schist, a poignard was made of reindeer horn, the handle of which is in the form of a reindeer himself. These all came from southern France, and are evidence of their existence in that locality, for the artist must have seen them before he could depict them.

The art tools with which this work was done have been found in considerable numbers. They are of flint, and have been chipped to the same sharp, triangular point as the steel graver of modern times.‖

The implements and utensils of every-day use were objects of an art by no means contemptible, even as compared with those of our times. The harpoons, needles, daggers, and other implements and utensils were so ornamented as to show an appreciation of decorative art applied to household or domestic uses which would not be unworthy the decorative schools of art of the nineteenth century.

* Plate XCI, Fig. 2.
† Plate XCII.
‡ Plate XCIII, Fig. 2.
§ Plates XCIII and XCIV.
‖ Plate XC, Fig. 2, and Plate XCI, Figs. 3, 4.





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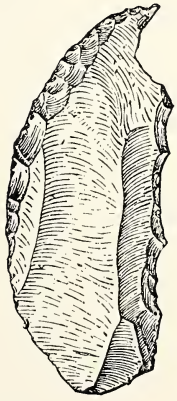

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## PALEOLITHIC IMPLEMENTS.

FIG. 1. Grotte du Placard. Charente, France.
FIG. 2. Flint graver. Gorge-d'Enfer, Dordogne, France.
FIG. 3. Flint flake; worked. Les Eyzies, Dordogne, France.
FIGS. 4 and 5. Flint points; worked to an edge. La Madeleine, Dordogne, France.

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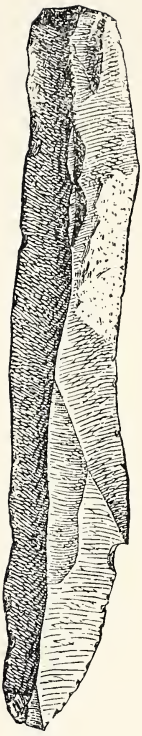

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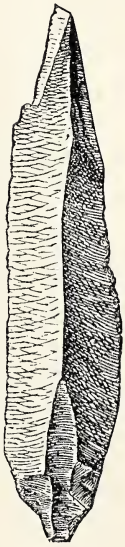

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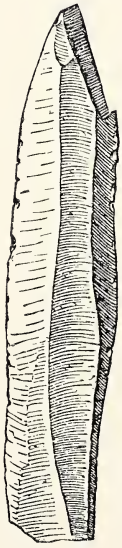

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PALEOLITHIC IMPLEMENTS.

FIG. 1. Flint scraper, with rounded end. La Madeleine, Dordogne, France.
FIG. 2. Flint flake; probably a saw or knife. La Madeleine, Dordogne, France.
FIGS. 3 and 4. Flint gravers. La Madeleine, Dordogne, France.

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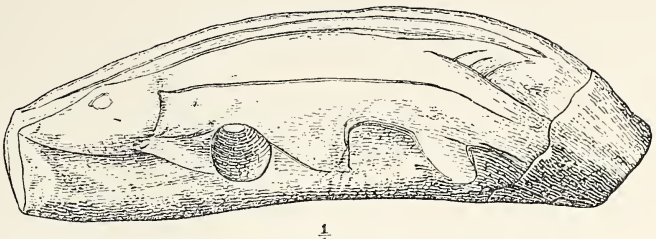
PALEOLITHIC IMPLEMENTS.

FIGS. 1, 2, 3, and 4. Harpoons made of reindeer horn. La Madeleine, Dordogne, France.

FIGS. 5, 6, and 7. Points and harpoons made of reindeer horn; hole and slit for attachment to shaft. Southern France.



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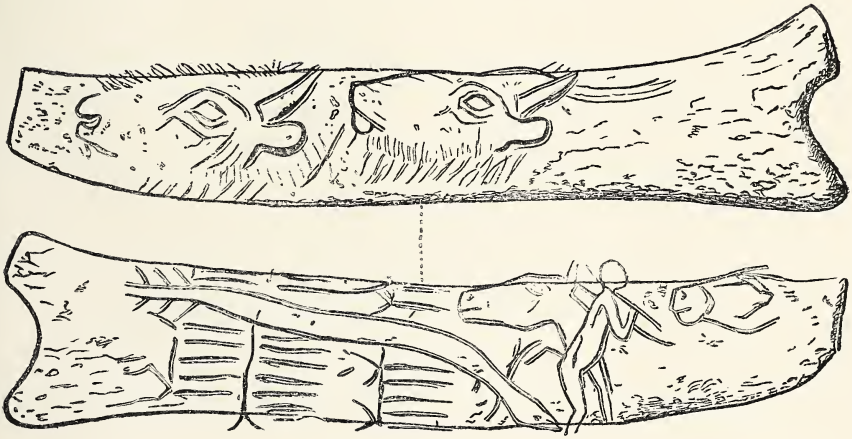

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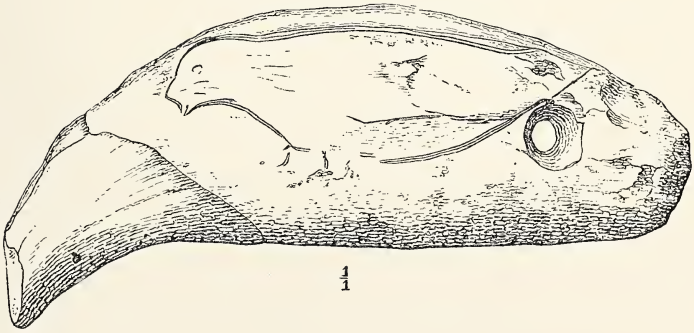

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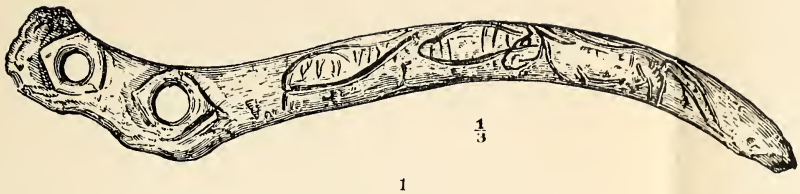
PALEOLITHIC ENGRAVINGS.

FIG. 1. Engraving of pike on canine tooth of bear. Grotte of Duruthy, southwestern France.

FIG. 2. Engravings of a man, horses, aurochs, and snake or eel on reindeer horn. La Madeleine, Dordogne, France.

FIG. 3. Engraving of seal on canine tooth of bear. Grotte of Duruthy, southwestern France.



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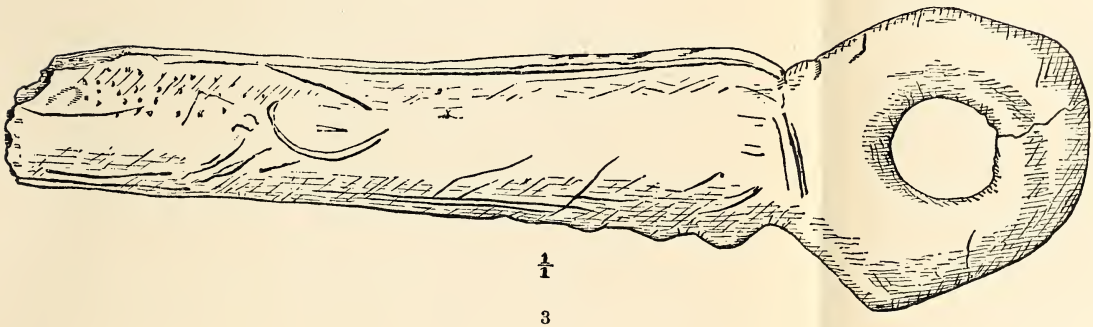

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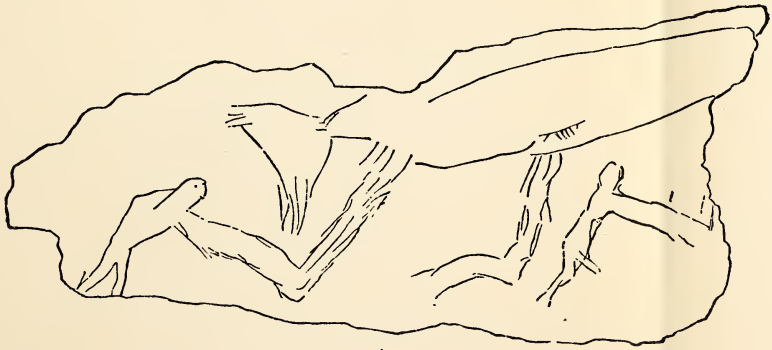

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## PALEOLITHIC ENGRAVINGS.

FIG. 1. Baton de commandment; reindeer horn, on which are representations of fishes and a horse. La Madeleine, Dordogne, France.

FIG. 2. Reindeer horn; representation of a fish. La Madeleine, Dordogne, France.

FIG. 3. Baton de commandment; reindeer horn, with tracing of a fish. Cave of Goyet, Belgium.

FIG. 4. Rude engraving on scapula of ox. Laugerie Basse, Dordogne, France.

There has also been found an instrument made of reindeer horn, the use of which is as yet unknown. It has been named "Baton (or stick) de Commandement," and is supposed to have been some sort of emblem of authority. Their length was such as to require the principal part of a reindeer horn, and from two to three holes about three-fourths of an inch in diameter were drilled through sideways.*

These artistic manifestations are intended not alone for utility, as in the decoration of implements, weapons, and utensils, but they display art for its own sake. Sketches have been discovered which, like those of many artists of the present day, appear to have been purely for practice or for innate love of the work.† They are mere essays, attempts in which the artists have made various efforts on the same piece without any attempted relation one to the other. The piece known as the combat of reindeer, five animals, Marquis de Vibraye's collection, is an example. Another is a sketch of eight animals, horses and deer, from the Cavern of Lartet, Judge Piette's collection. These are each on one piece; the lines run into each other. The animals represented are without relation to each other. They have even been done from different planes, so that some are upside down. Some are complete; others incomplete. The author of these sketches was only utilizing his material, as does the artist of to-day when he puts many studies on the same canvas. The mammoth engraved on a laminated piece of his own tusk, and the bear on a flat pebble, are purely artistic, are done solely for their art; while the sculpture of the mammoth and reindeer, decoration of the handles of daggers and poignards are such utilization as put one in remembrance of like work done by Benvenuto Cellini. Similar illustrations are found in the various "*Batons de Commandement.*"

The excellent and artistic work shown in these engravings and sculptures is itself strange enough. But the really wonderful and incomprehensible thing concerning them and the civilization belonging to this epoch is that at the close of the period the entire culture painted on its existence disappeared. It passed away and left no trace. Whatever may be the truth concerning this in other parts of the world, it appears to be certain in its relation to western Europe. This leads one to speak of the close of this period, and what has been called by some of the archæologists the hiatus; that is, the gap between that and the succeeding epoch or period.

I have already shown how the human occupation during the paleolithic period was spread generally over western Europe, but whether the subdivision or epochs according to the classification of de Mortillet extended to and were developed in other countries than France has not been determined, and there were persons of both ways of thinking. On one proposition, however, the archæologists seem to be agreed, that there were subdivisions in the paleolithic period, and they are to be traced and recognized by the differences in the human industry according to

* Plate XCIII, Fig. 2, and Plate XCIV, Figs. 1, 3. † Plate XCIV, Fig. 4.

their association and superposition. There are many illustrations to be given. The Grotte de Placard is situated on the banks of the river Tardoire, a branch of the Charente in the department of the same name. A cut of this grotte is given in Plate XC, Fig. 1. By its side is shown a section of the grotte made during its excavation. It is drawn to scale and shows the various strata of earth or débris with which the grotte was filled. The top layer was naturally the last in point of time to be laid down; the bottom was just as naturally the first. The divisions in the scale from the bottom to the top represent the various strata found during the excavation and their component parts show by their differences how they were deposited, each one subsequent to the other, and what were the distinctions between the habits or industries of the man who successively occupied the cavern during the filling of the respective strata.

A.—Strata of small pieces of rock and débris fallen from the roof of the cavern, and separating the archæologic layers: No traces of human industry, and, consequently, man was not present.

B.—A stratum of the same with a fine streak of clay.

C.—The top archæologic strata, 38 centimeters in thickness, belongs to the neolithic period for it contained pieces of property, fragments of polished stone flint hatchets, barbed arrow-heads, together with the bones of modern animals.

D, E, F, and H.—Four strata with the characteristic fauna and objects of industry of the prehistoric period, Madalénian epoch. These four, together with the intermediate strata are nigh 4 meters (5 feet) in thickness.

I.—A stratum of Solutrian industry of the finer and later order. Flint arrow or spear-heads with shoulder on one end.

K.—A stratum of the lower or earlier Solutrian with leaf-shaped implements.

L.—Stratum Moustierian with a characteristic point.

Although this evidence of chronologic and successive occupations can be repeated in many cases, yet it has not been universally accepted, and when accepted it has been with a different classification and nomenclature. The division into epochs according to the classification here adopted is not laid down as a hard and fast rule. It is only tentative and liable to be changed and modified by future discoveries. Whether all these subdivisions of the paleolithic period extended to and were developed in other countries than France has not been determined, and there are persons of both ways of thinking. The principal cause of my willingness to adopt the theory is that it makes a segregation of the objects and implements of the paleolithic period, and gives them a nomenclature by which they can be described and understood; it provides a common language for both hearer and speaker.

The man of the paleolithic period left no monuments. It appears that he built no houses for either the living or the dead. Indeed, it is doubtful if the dead were buried or had any place of sepulcher. The general belief is that he made no pottery. The sole exceptions to this have arisen in Belgium, since the discovery by M. Dupont in the Grotte de Furfooz, and MM. Fraipont and Lohest in the Grotte de Spy.

Portions of the skeleton of paleolithic men are believed to have been found in several places throughout western Europe. It is useless to attempt a full description of them; sufficient for my purpose to say that they have been determined, from investigation of the skull, to have been a long-headed race with retreating forehead and heavy frontal projection. Enough bones have been found to determine that he was of small stature, the extremities being comparatively short but heavy. The sinuses indicate the attachment of heavy muscles, and, consequently, great strength. The typical skulls of this race of men, and which have given their names respectively to it, are that of Neanderthal, the original of which is now at Bonn, and of Cannstadt, which is at Stutgard, both in Germany.

I have said that the human occupation during this period, as indicated by the remains of its civilization, extended generally over the world. What became of man at its close is not at all determined, and has scarcely been studied. In western Europe the scientists have had bettter opportunities than in this country, and, consequently, have made greater discoveries. It is the opinion of some that there was a hiatus between the two races; others, without admitting this, are equally satisfied of the great differences between the two. The neolithic man, so far as concerns western Europe, must have come from the east, that great foundation of civilization and unknown cradle of the human race. He occupied the same territory which was before occupied by paleolithic man, but what became of the paleolithic man is unknown and a mystery. Whether he migrated to the north, following up the Arctic animals when they took their departure; whether the neolithic man came down upon and exterminated him; whether he drove him off or absorbed the remnents, is as yet unknown. It may never be known, but it is a subject for investigation, and the scientists of these countries are engaged seriously in the work of examination.

On the subject of this hiatus or gap, Mr. John Evans says:

> There appears, in this country at all events, to be a complete gap between the river-drift and surface-stone periods, so far as any intermediate forms of implements are concerned; and here, at least, the race of men who fabricated the latest of the paleolithic implements may have, and in all probability had, disappeared at an epoch remote from that when the country was again occupied by those who not only chipped out but polished their flint tools, and who were, moreover, associated with a mammalian fauna far nearer resembling that of the present day than that of the quarternary times.
>
> So different indeed are the two groups of animals that, as has been already remarked, Mr. Boyd Dawkins has shown that, out of forty-eight well-ascertained species living in the post-glacial or river-drift period, only thirty-one were able to live on into the prehistoric or surface-stone period. Such a change as this in the fauna of a country can hardly have been the work of a few years, or even of a few centuries; and yet we must intercalate a period of time sufficient for its accomplishment between the farthest date to which we can carry back the neolithic period, and the close of the paleolithic period as indicated by the low-level gravels. The antiquity, then, that must be assigned to the implements in the highest beds of river-

drift may be represented (1) by the period requisite for the excavation of the valleys to their present depth; plus (2) the period necessary for the dying out and immigration of a large part of the quarternary or post-glacial fauna and the coming in of the prehistoric; plus (3) the polished stone period; plus (4) the bronze, iron, and historic periods, which three latter in this country occupy a space of probably not less than three thousand years. A single equation involving so many unknown quantities is, as already observed, not susceptible of solution.*

And Prof. Boyd Dawkins:

The great changes in the fauna and geography of Britain, at the close of the Pleistocene age, render it very improbable that the cave men were in any way represented by the neolithic tribes who are the first to appear in prehistoric Europe. The former possessed no domestic animals, just as the latter are not known to have been acquainted with any of the extinct species, with the exception of the Irish elk. The former lived as hunters, unaided by the dog, in Britain, while it was part of the continent; the latter appear as farmers and herdsmen after it became an island. Their states of culture, as we shall see presently, were wholly different. We might expect, on *à priori* grounds, that there would be an overlap, and that the former would have been absorbed into the mass of the new-comers. There is, however, no evidence of this. * * *

From the facts at present before us we may conclude that they belonged to two races of men, living in Europe in successive times, and separated from each other by an interval sufficiently great to allow of the above-mentioned changes taking place in the physical conditions of Britain. * * *

From the preceding pages the reader will gather a distinct idea of the physical condition of Britain in the neolithic age, and of the manners and customs of the inhabitants. The population was probably large, divided into tribal communities possessed of fixed habitations, and living principally on their flocks and herds, acquainted with agriculture, and subsisting in a lesser degree by hunting and fishing. The arts of spinning, weaving, mining, and pottery-making were known, and that of boat-building had advanced sufficiently far to allow of voyages being made from France to Britain, and from Britain to Ireland. Traffic was carried on by barter, and stone axes were distributed over areas far away from those in which the stone was found. Tombs also were built, some of imposing grandeur, for the habitation of the dead in the after-world, in which the spirits were supposed to lead a life not very different from that of the living, and at which they were worshiped by the family or tribe, after the manner of the red Indians and many African peoples. * * *

The neolithic implements and the domestic animals and plants, described in the preceding pages, have been discovered over the whole of Europe, with the exception of northern Russia and northern Scandinavia. They imply that the neolithic civilization was long established, and that it underwent so little change, if any, in the lapse of ages that no traces of a change have been preserved to our times. Its duration varied in different countries, and it yielded place to a higher culture in Greece and Italy long before it passed away from central and northern Europe. * * *

The introduction of this civilization is the starting-point of the history of the present inhabitants of Europe. To the neolithic peoples we owe the rudiments of the culture which we ourselves enjoy. The arts which they introduced have never been forgotten, and all subsequent progress has been built upon their foundation. Their cereals are still cultivated by the farmer, their domestic animals still minister to us, and the arts of which they only possessed the rudiments have developed into the industries—spinning, weaving, pottery-making, mining; without which we can scarcely realize what our lives would be.†

---

* Evans: Ancient Stone Implements of Great Britain; p. 618.

† W. Boyd Dawkins: Early Man in Britain; p. 265, etc.

Monsieur Gabriel de Mortillet in Le Prehistorique, page 479, discusses this hiatus between the paleolithic and the neolithic periods. He considers that the former belonged to the quaternary geologic period, while the latter belongs to the present, or period actual. He says that "Between these two epochs (that is, between the Madalenian epoch and the neolithic period) "there are differences everywhere; there exists a veritable revolution." And he puts in the form of a table, side by side, the differences.

(1) In the Madalenian the climate was cold and dry, with extreme temperatures.
(2) Existence of the last grand fossil species—the mammoth.
(3) Chamois, marmot, the wild goat in the plains of France.
(4) Reindeer, saiga (antelope), elk, glutton, white bear, in the center of Europe.
(5) Hyena and the grand cat tribe.
(6) No domestic animals.
(7) Human type uniform.
(8) Population nomadic.
(9) Hunters and fishers, but no agriculture.
(10) Stone implements always chipped.
(11) No pottery.
(12) No monuments.
(13) No burials; no respect for the dead.
(14) No religious ideas.
(15) A profound and pure artistic sentiment.

(1) In the neolithic period the climate was temperate and uniform.
(2) The mammoth extinct.
(3) Chamois, marmot, and wild goat have gone to the summits of the mountains.
(4) These animals have emigrated toward the Arctic region.
(5) No hyenas or grand cats.
(6) Domestic animals abundant.
(7) Human type much varied.
(8) Population sedentary.
(9) Agriculture well developed.
(10) Stone implements polished.
(11) Pottery.
(12) Monuments: Dolmens and menhirs; burial of the dead.
(14) Religious ideas well developed.
(15) No artistic sentiment.

This revolution is at once physical and industrial, natural and social. In the physical or natural there have been great changes in the climate, which proves changes of equal importance in the orography and geography, which in its turn was followed by profound geologic modification. This could be done but very slowly, and, therefore, there must have existed a long period of time between the two epochs. This can be assured by certain proofs. In the Grotte de Placard one can see between the uppermost stratum, containing implements of the Madalenian epoch, and that which contains implements of the neolithic period there is to be found a depot or stratum of fallen rubbish, principally small stone from the roof of the cavern, which is completely sterile, so far as concerns archæology, and is $70^{cm}$ in thickness. The Cavern of Laugerie Haute gives the same evidence and is even more conclusive. Between the strata of the two periods there exists a sterile stratum of $1.30^{m}$. In the Grotte de la Vache there exists a thick stratum of stalagmite, sometimes $45^{cm}$, between the Madalenian epoch and the neolithic period and the same difference exists between the industrial and

social cultures of the two epochs. The table just given, and which need not be repeated, shows the industries and customs of the two epochs to have nothing in common. There was a substitution complete of the former by the latter. The more advanced have entirely replaced the primitive. It has produced a phenomenon analogous to that which took place in America or the Oceanic Islands after the arrival of the Europeans. There is no progressive or local development, but an invasion of a superior civilization. There are the same changes in the races of the men of the two epochs, but, by atavism, we may find the type of the Chellian man reproduced in the neolithic period. If this be established by future discoveries, it would tend to show a contact of the two populations and that the hiatus was not real, but only a gap in our knowledge of the civilizations of the two peoples.

## NEOLITHIC PERIOD.

There was a marked improvement in the civilization of this period over that of its predecessor, the paleolithic. This extended to many things, but the distinguishing feature was the art of polishing or smoothing the stone implements and weapons. Therefore it has been called the polished stone age.

The characteristic implements of this period are the polished stone hatchets, called celts in England and America. They are found like the paleolithic Chellian implements, which preceded them, substantially all over the world, thus showing that this civilization must have endured for a long period of time and comprised an extensive population. The materials differ according to locality, and the form may vary with the requirements of the material.

The standard hatchet in Alaska is made of nephrite, that of the West Indies may be made of shell; there may be also slight differences of form, some having a square top, others being pointed. The Scandinavian hatchets are usually square in section and therein are different from others; they are also much longer, but this arises from the peculiarities of the material. The general likeness in these implements prevails throughout the world notwithstanding the minor differences mentioned. While an experienced prehistoric archæologist may be able to determine from an inspection of the polished stone hatchet from what country it comes and possibly to what locality it belongs, yet the statement is true that they are substantially the same implement and that the invention of the art of polishing, together with the form of hatchet, has passed by communication from people to people, country to country, and descended from generation to generation until it has spread everywhere. A series of the polished stone hatchets, or celts, from almost any one of the United States will stand as a fair representative of the same implement in any other State or country. The single exception to the universality of this statement is from Scandinavia. I shall not at present attempt any general description of the implements, weapons, or ornaments of

this period. That will be reserved until I come to speak of those from the United States, when it can be done more in detail and will not be a repetition.

The stone arrow or spear-head or knife is another equally characteristic implement or weapon of this period. The North American Indian was in the neolithic period of the civilization at the time of the discovery of the continent by Christopher Columbus. Although he used copper as a material for implements, yet it did not displace stone nor was its use sufficiently extended to establish an age of copper.

Another characteristic of the neolithic period was its monuments. Their erection and construction by man began in this period, and are therefore its oldest representatives in every country. In the United States they consist of mounds and earthworks, likewise stone and other forts. In western Europe principally of dolmens, menhirs, cromlechs, and alignments. I will not attempt any description of the monuments of the United States further than to say that many of them are believed to have been places of sepulture. Some of the forts, from their appearance and location, seem to have been erected as places of defense or for safety. But there are vast numbers both of mounds and earthworks which would seem so illy suited for the respective purposes indicated as that it is difficult to believe they were so intended. Many theories and arguments have been presented, but much of it has been of that kind which darkeneth wisdom by words without knowledge.

The excavations into the mounds and other prehistoric monuments in the United States have been unfortunately made more in pursuit of trinkets and to add numbers to the owner's collection than in the interest of science or for the purpose of discovering the history, customs, or civilization of the men who made the mounds. Any description at this time would necessarily be imperfect, and probably all who read this pamphlet will have had as much general and indefinite knowledge of these monuments as could be here given. Those who would know more concerning this subject must be referred to the special works treating thereon.

## DOLMENS.

The neolithic monuments of western Europe may be briefly described.

The dolmen was made in the form of a chamber or series of communicating chambers or alley-ways with sides, floor, and covers, and was a tomb.* Its floor and entrance were at about the level of the neighboring surface, and the entire monument is believed to have been covered with earth; thus in ancient times it was a tumulus. †

The covering stones of a dolmen have been found to weigh 5, 10, 20, and 40 tons. ‡ Used for sepulture they may be described as houses for the dead. They are perhaps the earliest form of receptacle for the dead, although the Kistvaen, made of smaller flat stones with sides, ends, top,

* Plates XCV to XCIX.

† Plate XCVI, Fig. 1, and Plate XCVIII, Fig. 2.

‡ Plate XCVII, Fig. 1.

and bottom shaped like a box or chest (Kist) and covered with stones like a cairn, may be older, but they may also have only been the sepultures of a poorer people.

The dolmens, usually square but sometimes round, were made in the form of chambers, sometimes as small as 4 by 6 feet, 4 feet high; sometimes these were 16 feet wide, 30 feet long, and 8 feet high. Most of the dolmens consist of a single chamber, but many have as many as six lateral chambers. They are made of huge flat unhewn granite stones, which are stood on end or edge to form the sides and ends of the chambers.* The covering stones (which are called tables) are large, and a single one is sometimes sufficient to cover the entiremonument.† The dolmens usually have a gallery or corridor leading to the chamber, made in the same way. This is for approach to the chamber. This gallery is about 3 or 4 feet wide and as many or more high, sufficient for a man to make easy entrance. It is sometimes blocked with another slab of granite at the inside and nearest the chamber, sometimes at the outside, and sometimes both. Fig. 2‡ will explain this. In this example the door has fallen in. Their orientation is irregular. They open in every direction, north and south, east and west; but there are more to the south than to the north, and more to the east than to the west. The greater number open towards the southeast. For purposes of comparison the ground plan of several of the important dolmens are here given.§ It will be perceived that though they are all one general type, yet no particular or precise form has been invariably followed in their construction. Each one has its own individuality and differs from any other.

The fine unshaded lines indicate the covering stones. The direction of the opening is indicated by letters SSE, etc.

(1) Dolmen of Kerlescant, at Carnac. This opens to the west. This dolmen is what is usually denominated *Allèe couverte.*

(2) Dolmen of Kervilor, at Trinitè-sur-Mer. Opening to SSE., one side square and one side round.

(3) Dolmen du Rocher, at Plougoumelen. Opening to SSE.

(4) Dolmen of Crucuno—same as Fig. 1.‖ Opening to SE., chamber rectangular.

(5) Dolmen of Keroed-Kerzu, at Crach. Opening to east, circular chamber.

(6) Dolmen of Ben-er-Groah, at Lochmariaquer. Opening south, two successive circular chambers.

(7) Dolmen of Kervihan, Carnac. Two chambers, semi-circular, with alley between. Opening SSE.

(8) Dolmen of Keriaval, near Plouharnel-Carnac. Three lateral chambers, opening east.

(9) Second dolmen of Manè Kerioned, near Plouharnel. This is one of three in the same tumulus—side by side—opening south, and is elaborately sculptured on the face of the supports.

(10) Three dolmens of Rondessec, at Plouharnel, all under the same tumulus, opening SSE. In one of these was found a pair of gold bracelets, one of which is still to be seen at Pere Gaillard's, Plouharnel.

(11) Small type dolmen of Kermario, Carnac. Opening to southeast.

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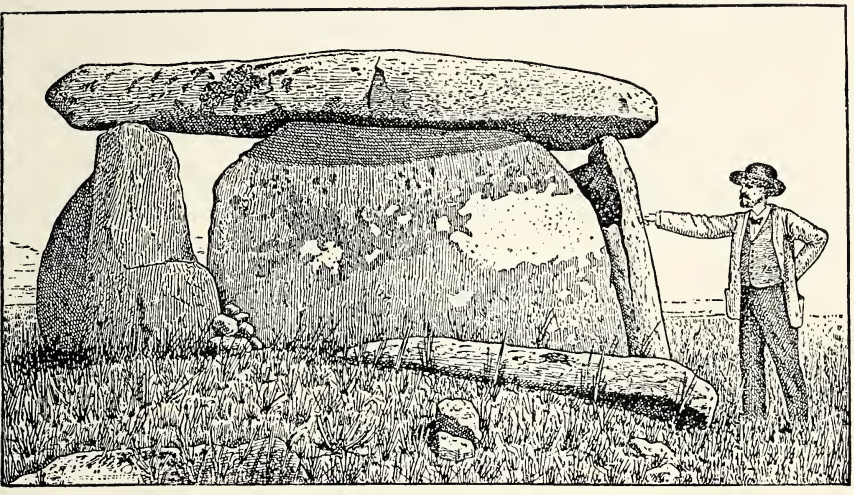
* Plate XCV, Fig. 1; Plate XCVIII, Fig. 1.
† Plate XCVII, Fig. 2.
‡ Plate XCV.
§ Plate XCIX.
‖ Plate CVII.



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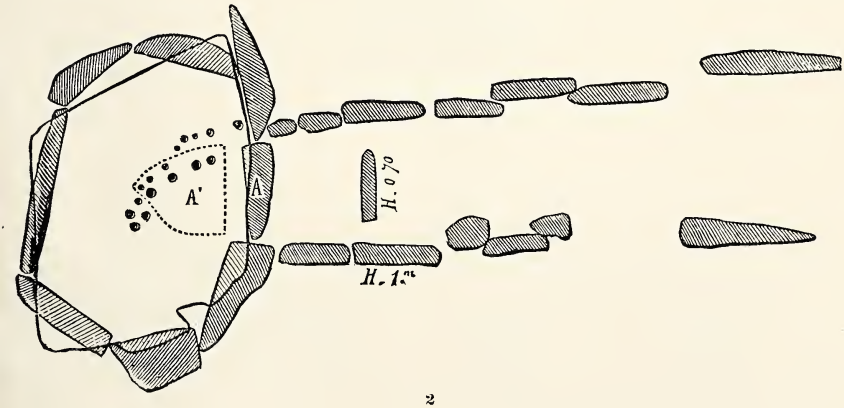
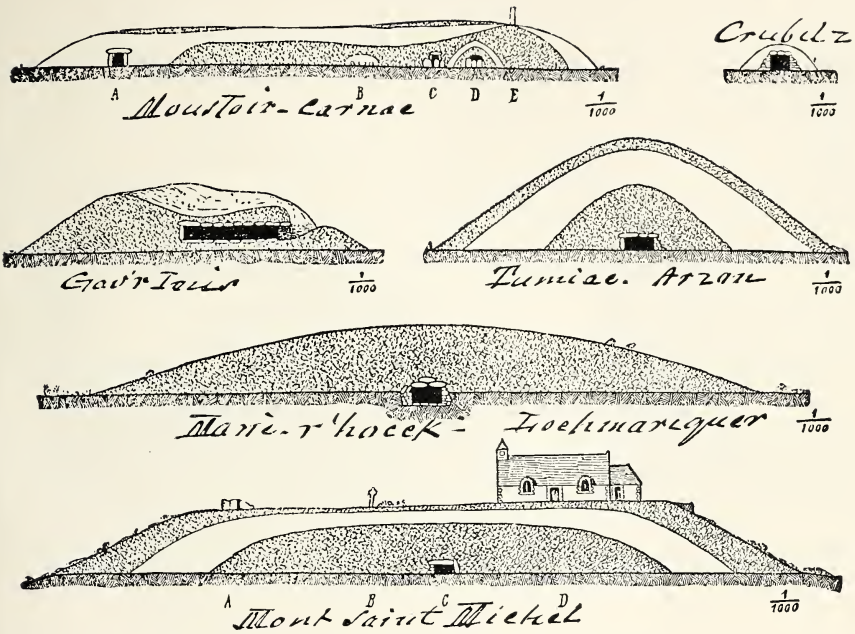



2

NEOLITHIC MONUMENTS—DOLMENS.

FIG. 1. Dolmen of Palo de Vinha, Portugal.

FIG. 2. Ground plan of dolmen of Palo de Vinha, near Evora, showing the stones on edge forming the gallery, chamber, and door. The light line around shows the covering stone with a group of cup-markings on the under side.

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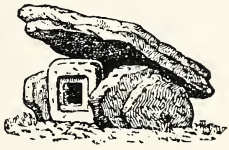

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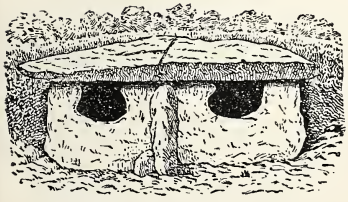

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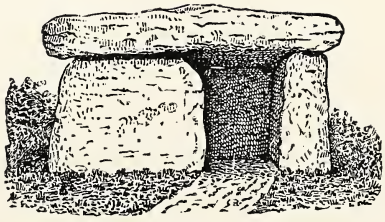

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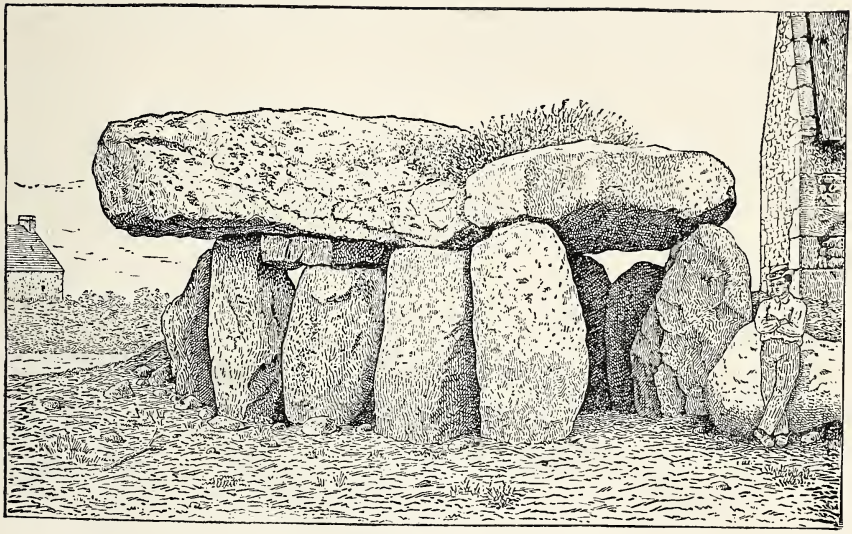
NEOLITHIC MONUMENTS—TUMULI AND DOLMENS.

FIG. 1. Tumuli in Brittany.
FIG. 2. Dolmen d'Ala Safat, Palestine.
FIG. 3. Double dolmen, near Veevajapett, southern India.
FIG. 4. Dolmen de Thizay, Indre-ét-Loire, France.



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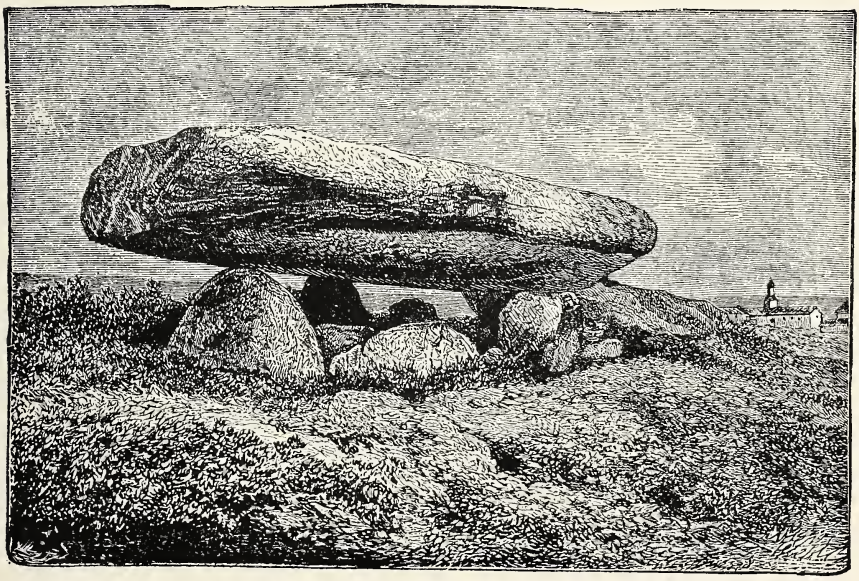

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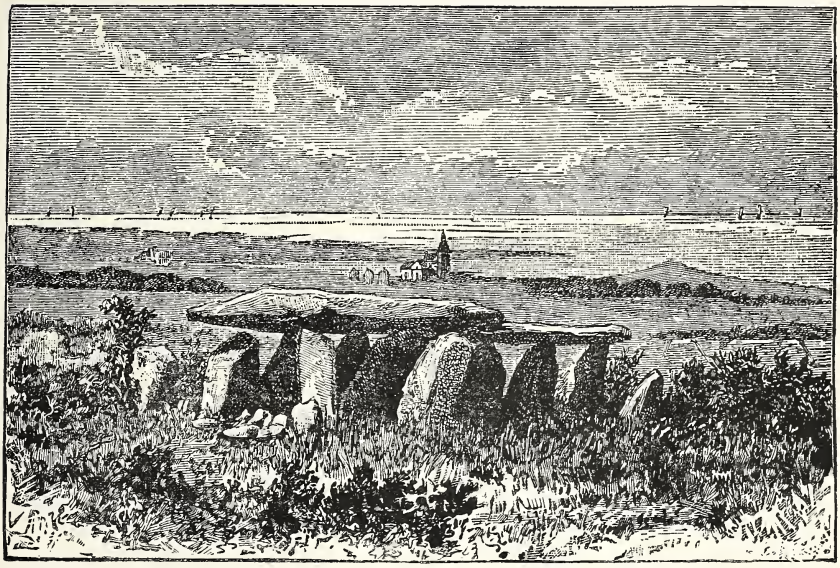
NEOLITHIC MONUMENTS—DOLMENS.

FIG. 1. Dolmen of Crucuno, Morbihan, Brittany.
FIG. 2. Dolmen of Lochmariaquer, Morbihan, Brittany.



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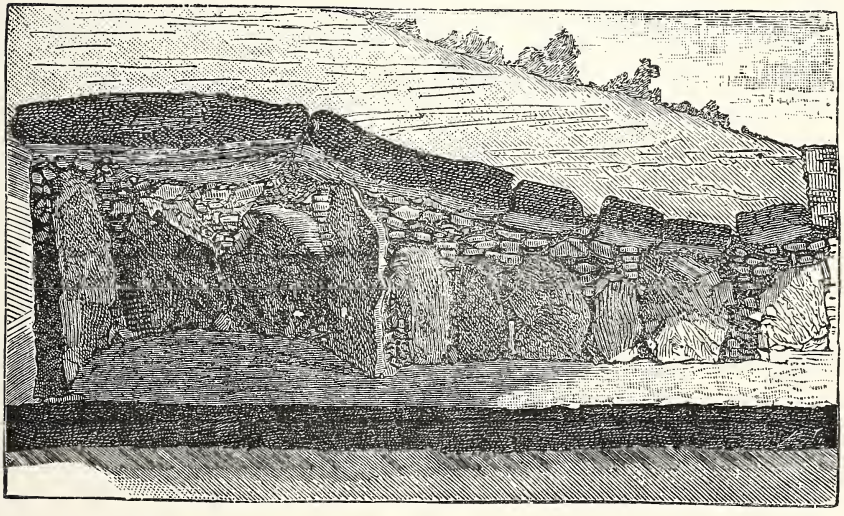

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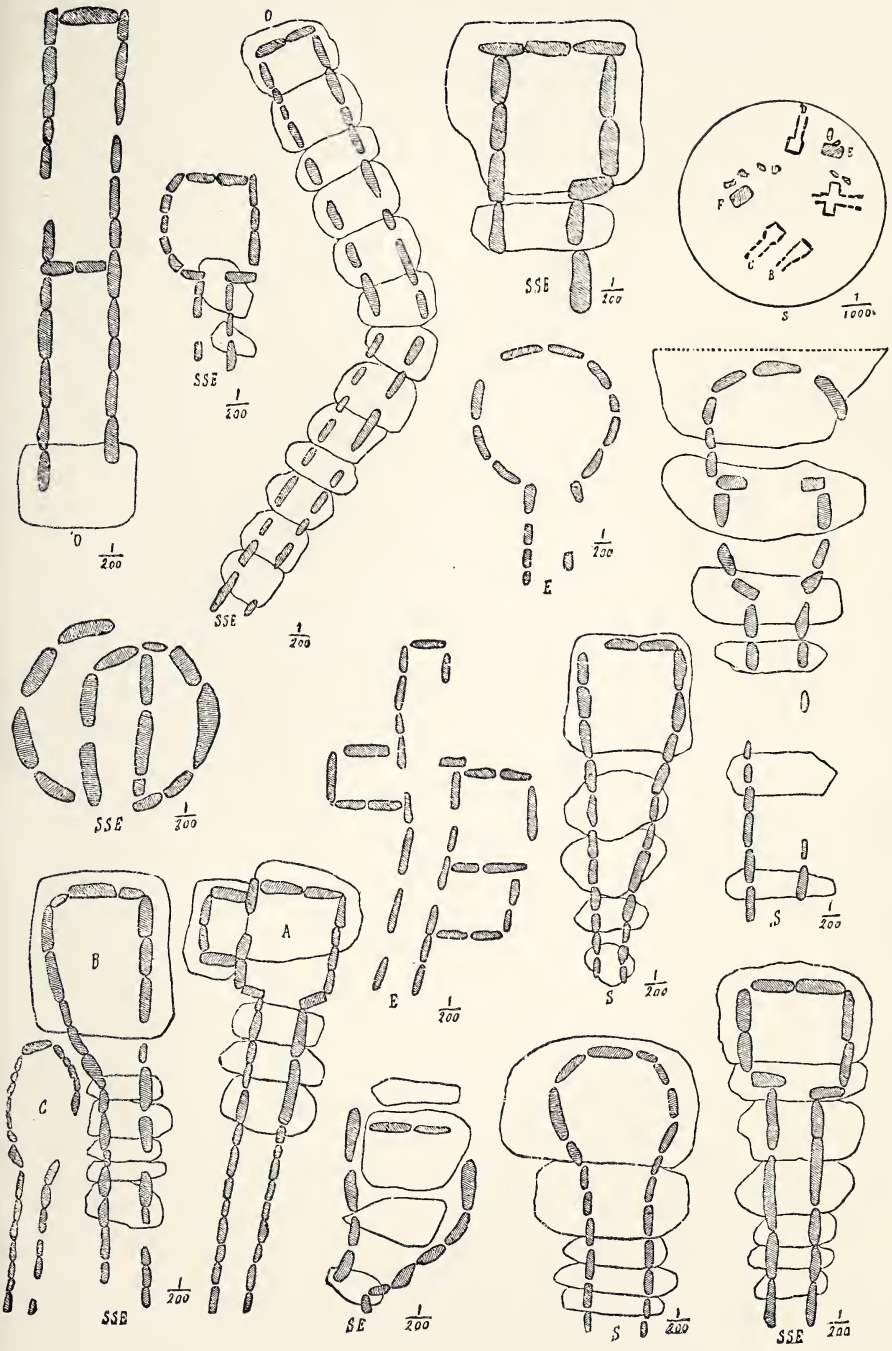
NEOLITHIC MONUMENTS—DOLMENS AND TUMULUS.

FIG. 1. Dolmen of Grand Island.

FIG. 2. Dolmen and tumulus of Kercado near Plouharnel-Carnac, Morbihan. Section showing the chamber and the corridor or covered way by means of which second and subsequent interments were made.




NEOLITHIC MONUMENTS—GROUND PLANS OF DOLMENS IN BRITTANY.

(12) Dolmen of Manè Lud, at Lochmariaquer. Opening south.

(13) Dolmen (with tumulus) of Kercado, Plouharnel, SSE.

(14) Tumulus of Pornic, Loire-Inférieure, in the upper right-hand corner. This contains several dolmens opening in different directions. A opens to the east. B and C to the southwest. D to the north. E and F in ruins.

It is believed that the interments were made continuously in the same sepulcher (as is done partially in our own vaults), a practice which prevails to a certain extent in the country to the present day. When the dolmen or tomb became full, the skeletons could have been taken out and deposited in an ossuary.

It was once the fashion to speak of these monuments as having belonged to the Druids. This seems to have been a tradition that has grown up within historic times and long after the Druids had passed away. The dolmens belonged as well to the age of bronze as to that of polished stone. Incineration and inhumation were both customary, but the former method pertains more to the bronze age.

There are about thirty-five hundred dolmens in France. They are plentiful in the center, south, and west, but rarer in the north and east; plentiful in Great Britain and Ireland, in Spain and Portugal, in Denmark and Sweden; some in Belgium and Holland, the Rhine country, and Western Germany; none in Norway; almost none in Italy; none in Eastern Europe. The city of Dresden marks about the dividing longitudinal line. They are found on the coast of Northern Africa between Morocco and Tripoli, in Palestine, in Asia, in South and Central America, but not in North America.

Many of the dolmens are now covered with earth, and these have been called tumili. It is believed by those best qualified to judge, after the longest experience and closest examination, that all have been at one time so covered. One reason for this belief is that it is universal to find the gallery, corridor, or covered way made of the same kind of stones in the same way, on the same level, and leading from the principal chamber, gradually narrowing in both width and height to what would appear to have been the circumference of the tumulus. In this regard the dolmen now without a tumulus corresponds exactly with those covered by one. Some of these corridors are 40 and 50 feet in length. In this way the tomb could be covered, the monument completed, and yet the entrance be easily opened and entered upon the occasion of a second or subsequent interment.

The covering of these tumuli consists of layers of broken granite alternated with layers of clay and mud from the seashore and vegetable earth from the neigboring surface.

The tumulus of Gav'r Inis has a dolmen remarkable for the sculpturings. It is 8 feet by 7, 5 feet 8 inches high, with a corridor or alley 14 feet long, 4 feet 6 inches wide; 5 feet 4 inches high, while the tumulus crowning it is 180 feet in diameter and was 30 feet high. (See Plate XCVI.)

Tumiac at Arzon is 100 feet in diameter and 65 feet high; Manì-r-

'hoeck is 300 feet in diameter and 30 feet high; Mane Lud 300 feet long, 150 wide and 30 feet high; Mont Saint Michel 320 feet long, 120 feet wide and 80 feet high; Kercado is about 100 feet in diameter and 20 feet high.

## MENHIRS.

The dimensions of some of the menhirs is as follows:

Penmarck, 25 feet high;* Cadiou, 28;† Mount Dol, 31; Plouarzel, 36½; Plesidy, 37, and Lochmariquer, 67½. The latter, fallen and broken, is 13½ feet wide and 7½ feet thick, and weighs 347 tons. There are seven hundred and thirty-nine of these in Brittany. The menhir stands single and alone. When arranged in parallel lines, as they sometimes are, they are called alignments.

## ALIGNMENTS.

The Province of Brittany has twenty-three alignments—one-half of those in all France. The department of Morbihan and Finistère have, together, seventeen of these. Carnac has in its immediate neighborborhood six out of these seventeen. These six alignments represent three thousand menhirs.

Menec, near Carnac, has eight hundred and thirty-five menhirs, arranged in eleven parallel lines, 3,778 feet in length, and 328 feet in breadth at the head, tapering to 200‡ feet at the tail. It has at its head a cromlech of sixty-two menhirs.

Kermario has six hundred and seventy-eight menhirs, no cromlech, nine parallel lines, 4,037 feet in length—same width as Menec.

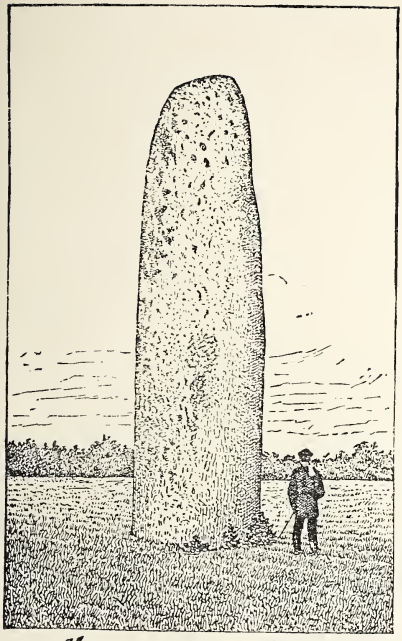
Kerlescant has two hundred and fifty-eight menhirs, a cromlech square of thirty-nine menhirs, thirteen lines, 1,000 feet in length—393 feet width at the head and 164 at the tail.

Erdeven has thirteen lines, one thousand one hundred and twenty menhirs, 6,886 feet in length, 836 in width at the beginning, and 180 at the end.

About one-half of these have been overthrown and are lying on the ground. Nearly 10 per cent. should be added for the menhirs known to have been destroyed in modern or historic times. Without doubt the gaps now existing were once filled. This would double, at least, the number. These monuments have served as stone quarries for the neighborhood, and doubtless the great castles and churches of the early ages were built therefrom.

There is on the menhirs no mark of tool or quarrying, yet I think they were quarried. They are so much weathered that all marks are worn away. Look at the weathering on the top of the menhir of Penmarck (Pl. c, Fig. 2). No traces of a quarry have been discovered, though the granite of which the menhirs are formed is the local rock, coming always and many times quite to the surface. The menhirs have evidently been planted. In most cases they stood on the surface with-

* Plate c, Fig. 2. † Plate c, Fig. 1. ‡ Plate c, Fig. 3.



Menhir of Cadiou

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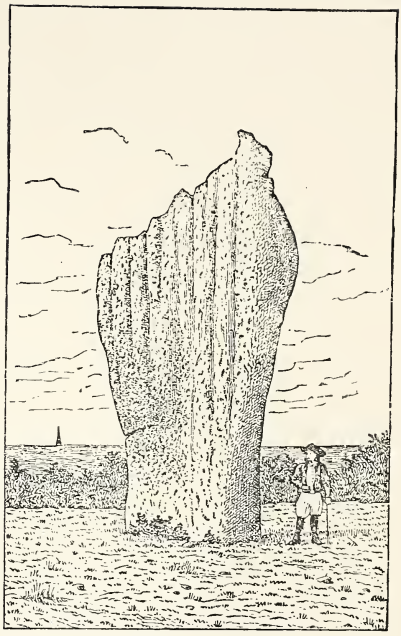

– of Penmarck

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NEOLITHIC MONUMENTS—MENHIRS AND ALIGNMENTS.

FIG. 1. Menhir of Cadiou.
FIG. 2. Menhir of Penmarck.
FIG. 3. Alignment of Menec, near Carnac.

out any foundation, but foundations had been built where needed. In many cases the smaller end of the stone was downwards.

Flint implements and chips, and broken pottery are found about and among the alignments as elsewhere over the country, especially around the foot of the menhirs, showing a prehistoric occupation; but no traces of the use or purposes of the menhirs or alignments have ever been discovered. There have been many theories broached but no facts adduced sufficient to support them. They have been called military camps or religious or other rendezvous for the people. They may have been tents. No trace has been found of their use as burial places, and so far as established by ascertained fact, the popular idea is as near the truth as any other, viz., that they were the columns of a sacrilegious invading army, turned to stone by the wrath of an offended God.

### SCULPTURINGS.

Many of these stones or monuments have marks or sculpturings on them. The menhirs of the alignments have cup markings only, and these are rare. In some cases they have been marked in modern times with crosses, made sometimes by religious devotees, sometimes by the priests, done in order to prevent or break up any chance remaining pagan custom of worshipping, revering, or employing these stones. The dolmens are marked with various signs. These might be set out in full but for want of space, though none however have any discovered signification.

### LAKE DWELLINGS.

Switzerland is the country of lake dwellings, because it abounded in lakes, and the mountains were not inviting dwelling places; but lake dwellings extended over the adjoining districts of France, Italy, and Germany, were similarly situated, and they have lately been found in Scotland.

The lake dwellings were, as their name imports, human habitations on the lakes. They were built near the shore, consisted of houses, and possibly other structures, such as shops, barns, stables, granaries, erected on piles placed in the lake bottom, and which, standing above the surface of the water, were cut to a general level and then floored over for the entire settlement. The houses were connected with the mainland by a bridge (probably with a draw), the piles of which it was constructed being often found.

There have been differences of opinion as to the houses. Keller supposed them to have been square or a parallelogram, while Dr. Gross believes them to have been round. They were destroyed before the beginning of history, and practically all that is known of them is derived from the discovery of the relics. The water has preserved the piles so that they are frequently visible from the surface, though they are usually decayed to the surface of the earth at the bottom of the

lake. Many times, as at Robenhausen, the lake has filled up with peat and turf, and the piles and other objects are only found by digging.

Such is always the case with the *terremare* of northern Italy. These were probably lake dwellings similar to those of Switzerland. The evidence of the use of piles is manifest, and from the relics found it is believed that they were contemporaneous in time and in civilization.

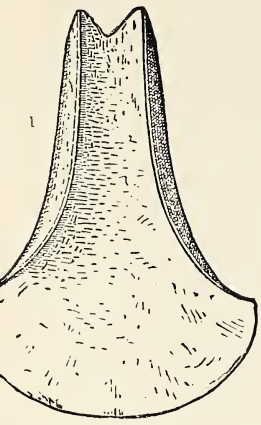
The greater number of lake dwellings are supposed to have been over the water, although near the shore and where it was shallow, but many (the number can not be estimated, owing to the greater facility for decay and destruction) were on the mainland.

The era of lake dwelling forms no epoch in itself; they were only the incidents of location. The dwellings on a given spot may have been removed again and again, even in the same age, the preceding settlement having been destroyed, possibly by fire, possibly by an enemy. At Robenhausen, which station has given its name in France to the neolithic age, there were three prehistoric occupations, one on top of the other, and each was destroyed before the next began. The tops of each set of piles are from 3 to 5 feet higher than the earlier set. The number of houses in the first occupation has never been estimated; that of the second has been estimated at thirty, and the third and last at fifty houses. The settlement covered nearly three acres and contained about 100,000 piles.

Keller reported in 1879 one hundred and sixty-one prehistoric lacustrine stations, and I can suppose the number discovered has doubled since then.

The occupation of the lakes for dwellings continued through the bronze and iron ages, as well as during that of stone. These different occupations were not always continuous, perhaps never were. In many places, notably at Morges, on Lake Geneva, there are three different stations occupied by prehistoric man, each independent of the other—all within a space of 500 or 600 yards. The first was called "The Church," the implements of which were all stone—no metal; the second, Roseaux—a mixture of stone and the straight flat bronze hatchets belonging to the earliest period; the third, the great city of Morges, in which the implements found, to the number of five or six hundred, all belonged to the fine age of bronze—no stone. Here there could have been no contemporaneity—no mixture. Each must have been destroyed before the other began. That this could be, is proved from what we know from history, for the present town of Morges has existed for a thousand or fifteen hundred years, until 1854, without a suspicion that these other three towns had consecutively existed on its site.

In the Lake of Geneva there are fifteen or twenty stations belonging to the neolithic age and twenty-five or thirty to the bronze age. In the common cantonal map there is shown in Lake Bienne two stations of the stone age, four of bronze, and four of iron—in Lake Morat five of stone, four of bronze, and two of iron—in Lake Neuchatel nineteen of



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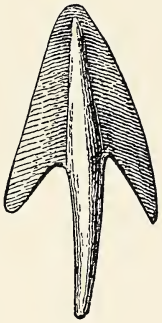

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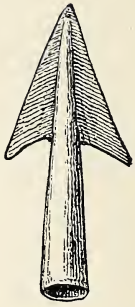

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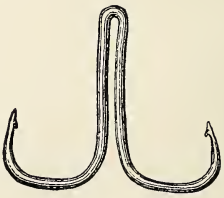

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## BRONZE IMPLEMENTS.

FIG. 1. Bronze hatchet (first style); standard type.
FIG. 2. Bronze hatchet (second style); standard type.
FIG. 3. Bronze hatchet (third style); standard type.
FIG. 4. Bronze hatchet (fourth style); standard type.
FIG. 5. Bronze arrow-point; stemmed.
FIG. 6. Bronze arrow-point; socketed.
FIG. 7. Bronze fish-hook; single barb.
FIG. 8. Bronze fish-hook; double-barbed.

stone, sixteen of bronze, and four of iron. This is highly imperfect, for I know many stations not noted, and where noted as one they really include several stations. At Chevroux, Lake Neuchatel, I found twelve stations, of which seven belonged to the neolithic and five to the bronze age, yet they are noted at only one of each. An idea of the extent of these stations may be obtained from the fact that they contain from ten thousand to one hundred thousand piles. I drew one out at Estavayer, Lake Neuchatel, and brought it home, and it and its cast are now in the Smithsonian Institution. At the station of Wallishofen, Lake Zurich, discovered about three years since, there have been found no less than two thousand bronze hair-pins, some long with large and beautiful heads, which, when polished to their original gold color, must have given a gorgeous appearance to the female head-dress of that age.

### BRONZE AGE.

So called because bronze was the material of which the cutting implements were made. The progress in its manufacture is plainly indicated in both form and method. The material is not a natural primitive one, but a combination of copper and tin in varying proportions of 9 to 1. It was not made in Europe, but seems to have been brought from Asia, and was used over many times by recasting. No less than fifty-seven foundries of bronze have been discovered in France, and a proportionate number in Italy, the one at Bologna having no less than fourteen thousand pieces broken ready for melting and recasting. The people of the bronze age in Europe were the descendants of those of the neolithic age, and their hatchets were at first made in the same general form as the polished stone hatchet of their ancestors. They were straight, flat, thin, and made by hammering. Increased strength was obtained by hammering the edges into projections which afterwards increased to wings. This was the second step of progress. Then the hatchets were cast in moulds with wings and a stop which prevented the splitting of the handle. Lastly was invented the socketed hatchet, into which the handle (bent at the poll) was inserted. Nearly all the latter forms had an eye with a hole therein, on the inside of the hatchet, by which it could be lashed to the handle which prevented the edge from working outwards.*

### PALEOLITHIC IMPLEMENTS IN AMERICA.

The paleolithic implements of the United States are similar to those of Europe in form, appearance, and mode of manufacture, though not usually so well finished. If classified according to Mortillet, they would belong to the earliest epoch of the paleolithic period—the Chelléen. The investigations concerning these implements have not been very profound, nor has it been settled to the satisfaction of all prehistoric archæologists, perhaps not even to a majority, that they are truly paleolithic implements. There have been various contentions concerning this.

* Plate CI, Figs. 1, 2, 3, 4.

They have been discovered in almost every State of the United States, and if they be accepted as such, their presence would prove the occupation of America by man during that period. This presence and occupation, and the consequent antiquity seems to have been established by the discovery of implements of human manufacture which it is not possible to avoid calling paleolithic, at various localities in the United States. These implements have been found to the number of several hundred by Dr. Abbott in the gravels of the Delaware River, as they were washed from the glacial terminal moraine and deposited at Trenton, New Jersey; also by Miss Franc E. Babbitt, in the gravels of one of the terraces of the Mississippi River, at Little Falls, Minnesota. Similar implements have also been found in the gravels of the Little Miami River, at Loveland, Ohio, in White River, Indiana, and in the Columbia gravels of the railway cuts south of Chester, Pennsylvania. The association and condition of these finds would seem to satisfactorily establish the antiquity of man's occupation in this country. Similar implements have been discovered on the surface in almost every State.

A circular, No. 36, was issued by the Smithsonian Institution in January, 1888, in which the following questions were put for information concerning these implements:

Question 1.—How many of these rude stone implements have you in your collection?

Question 2.—Of what material are they made?

Question 3.—Where have they been found?

(1) As to locality.

(2) Position, condition and associated with what objects.

(3) Whether on or under the surface, and if so, at what depth, and in what kind of geologic formation.

(4) Were they found in mounds, tombs, or other ancient structures.

(5) Were any other ancient implements found with them, and if so, of what kind.

(6) Did their deposit seem to be accidental or intentional.

(7) Have they been described in any publication, and if so in, what, and where can it be obtained.

(8) Can you forward specimens (as many as possible) to this Museum in exchange for publications or duplicate specimens.

Answers and information responding to these questions not heretofore given are still desired, to the end that the record may be kept up.*

Cuts of certain paleolithic implements were given for information and comparison, among which were the following:

* The information received up to date in reply to this inquiry is embodied in a paper in this report entitled "Results of an inquiry as to the existence of man in North America during the paleolithic period of the stone age."

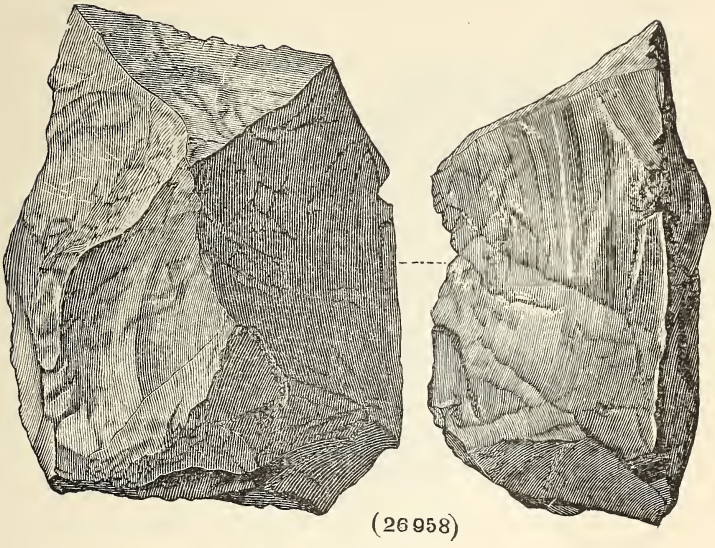


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Fig. 1.

JASPERY FLINT.

(Trenton gravels, New Jersey. Received from Dr. C. C. Abbott.)

Primitive Industry: Chap. XXXII, p. 471.

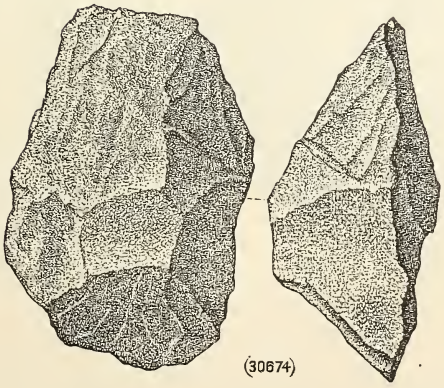


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Fig. 2.

GRAY QUARTZITE.

(Banks of the Schuylkill, Berks County, Pennsylvania. Received from A. F. Berlin.)

American Antiquarian: Vol. I, p. 10.

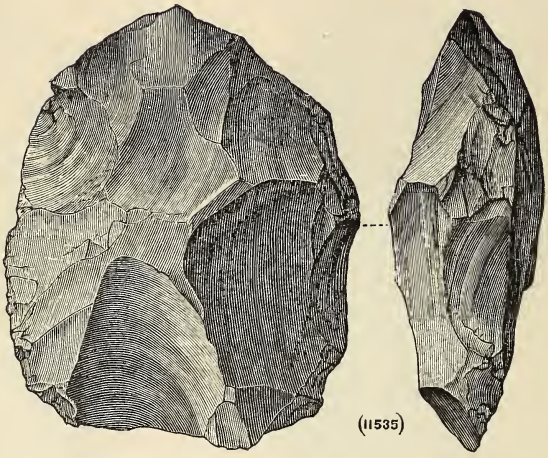


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Fig. 3.

BLACK FLINT.

(Wyoming Territory. Collected by Dr. Joseph Leidy.)

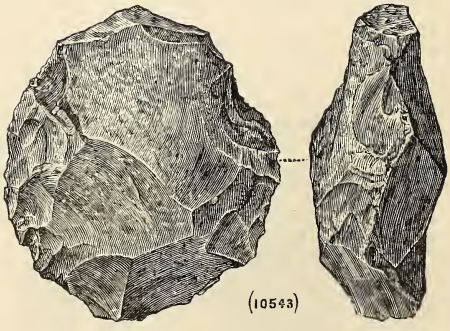


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Fig. 4.

BROWNISH-YELLOW JASPER.

(Wyoming Territory. Collected by Dr. F. V. Hayden.)

These two implements* came from the Bridger Basin in the Uintah Mountains in southwestern Wyoming and Northern Utah, explored by Professor Hayden and Dr. Joseph Leidy. Report of the U. S. Geological Survey, 1872, p. 652.

* See Figs. 3, 4.

This implement* was made from a pebble which has been split in two. The upper or flat surface shows the chips with the bulb of percussion by which it was worked. A portion of the rolled surface of the pebble is left untouched, and shows in the cut, proving beyond doubt its intentional and consequently human manufacture. It is impossible that these fractures should have been either natural or accidental. This exhibition of the rolled surface, the crust of the pebble, is a peculiarity belonging chiefly to the valley of the Potomac, where they have been found in considerable numbers. I have ventured to name this the Washington implement, in contradistinction from that other kind which is chipped all over, shows no trace of the crust of the pebble, and which Dr. Abbott once named "Turtle back," but is now by his consent changed to "Trenton implement."

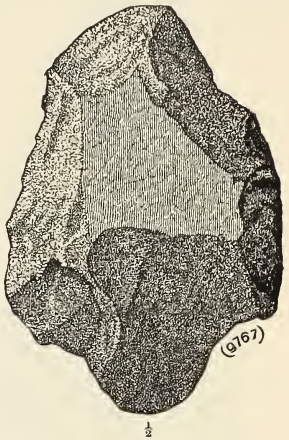


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Fig. 5.

YELLOWISH-BROWN QUARTZITE.

(Pamunkey, Charles County, Maryland. Collected by O. N. Bryan.)

½

Fig. 6.

INDURATED CLAY SLATE.

(Pamunkey, Charles County, Maryland. Collected by O. N. Bryan.)

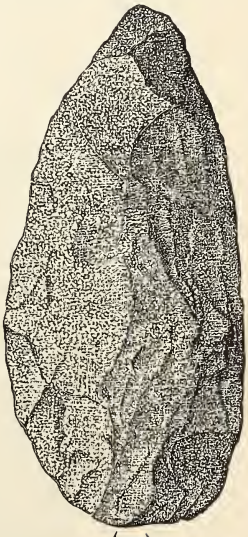


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Fig. 7.

REDDISH QUARTZITE.

(Georgetown, District of Columbia. Collected by James Webster.)

* See Fig. 5.

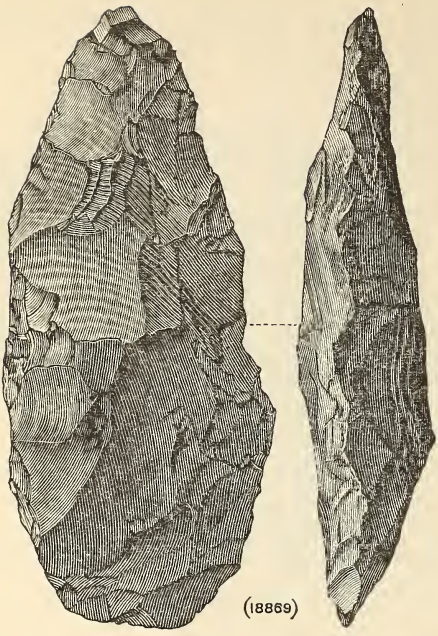


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Fig. 8.

PALE GRAY FLINT, having somewhat the appearance of agatized wood.

(Austin, Texas. J. Van Ostrand.)

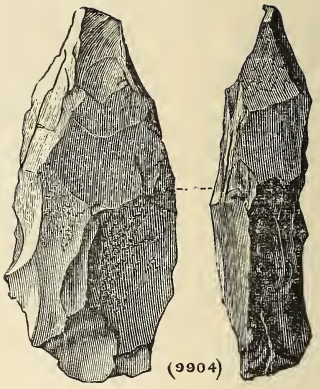


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Fig. 9.

YELLOW CHERT (from a shell heap on the Tennessee River, adjoining and opposite Savannah, Tennessee).

(Collected by J. Parrish Stelle.)
S. I. Report, 1870, p. 414.

These implements* are to be remarked as representatives of a possible new type. They are smaller and thinner than the others, and are

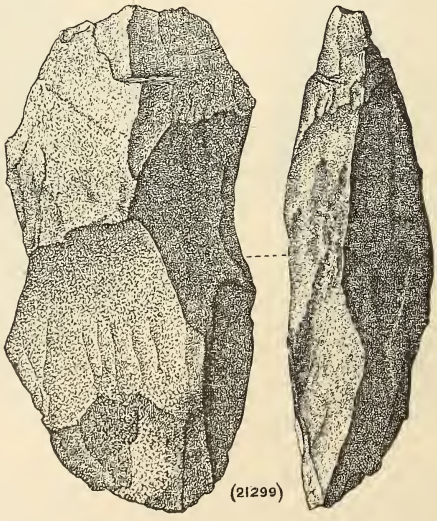


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Fig. 10.

PORPHYRITIC FELSITE.

(Raleigh, North Carolina. Collected by Howard Hayward.)

* See Figs. 6, 7, 8, 9.

found more frequently in the river valleys and on the lowlands, while the others are found more on the bluffs and highlands. They may be found in the neighborhood of mounds and other places of apparent Indian occupation, while the larger kind do not always seem to be.

This implement* corresponds closely in appearance, material, and mode of manufacture to the average paleolithic implement; but there is a remarkable difference in that this is notched on the edges, apparently for the purpose of attaching a handle with a withe or thong, and some of them show traces of such usage by these edges being worn smooth. This feature is unique and has never been found belonging to an undoubted paleolithic implemment. The question whether they are paleolithic must therefore be held in abeyance and for further examination. They have been reported principally from the Atlantic slope. The United States National Museum possesses about sixty-five specimins. It has been suggested that these implements have been used as agricultural digging implements, also that they have been used as adzes for the making of canoes and for scooping out soap-stone pots and vessels. If any of these uses should be accepted it would decide prima facie that they were not paleolithic.

The following is a résumé of the information and contributions received in response to this circular.

| State. | Answers received. | Implements reported. | Number sent. | Original number in Museum. | Total. |
|---|---|---|---|---|---|
| Maine | 9 | 196 | 19 | 3 | 218 |
| Vermont | 6 | 70 | 27 | ..... | 97 |
| Massachusetts | 14 | 79 | 17 | 96 | 393 |
| Connecticut | 3 | 8 | ..... | 19 | 27 |
| New York | 20 | 530 | 95 | 7 | 632 |
| New Jersey | 3 | 348 | 2 | 41 | 591 |
| Pennsylvania | 20 | 1,000 | 180 | 39 | 1,219 |
| Maryland | 4 | 33 | ..... | 59 | 92 |
| District of Columbia | 8 | 869 | 239 | 298 | 1,406 |
| Virginia | 3 | 400 | 26 | 13 | 439 |
| North Carolina | 2 | 13 | 23 | 5 | 41 |
| South Carolina | 3 | ..... | ..... | ..... | ..... |
| Georgia | ..... | ..... | ..... | 10 | 10 |
| Florida | 1 | 20 | ..... | 31 | 51 |
| Alabama | 3 | 1 | 8 | 25 | 34 |
| Texas | 1 | ..... | ..... | 6 | 6 |
| Ohio | 29 | 1,215 | 71 | 66 | 1,352 |
| Indiana | 13 | 489 | 26 | 26 | 541 |
| Illinois | 17 | 189 | ..... | 23 | 212 |
| Kentucky | 2 | 25 | ..... | 15 | 40 |
| Tennessee | 5 | 48 | 30 | 18 | 96 |
| Michigan | 9 | 224 | 6 | ..... | 230 |
| Wisconsin | 6 | 21 | ..... | 6 | 27 |
| Iowa | 3 | Few ..... | 10 | 2 | 12 |
| Missouri | 7 | 335 | 10 | 5 | 350 |
| Arkansas | 2 | 86 | ..... | 4 | 90 |
| California | 5 | 57 | ..... | 38 | 95 |
| Minnesota | 2 | ..... | ..... | 48 | 48 |

* See Fig. 10.

| State. | Answers received. | Implements reported. | Number sent. | Original number in Museum. | Total. |
|---|---|---|---|---|---|
| Oregon | | | | 7 | 7 |
| Kansas | 5 | | | | |
| Nebraska | 1 | | | 3 | 3 |
| Colorado | | | | 8 | 8 |
| Utah | 1 | | | 25 | 25 |
| Wyoming | | | | 4 | 4 |
| Arizona | 1 | | | | |
| Canada | 1 | 106 | | | 106 |
| Total | 209 | 6,762 | 789 | 950 | 8,502 |

RECAPITULATION.

| | |
|---|---|
| Original number in Museum | 950 |
| Number sent | 789 |
| Number of implements in Museum | 1,739 |
| Total implements reported as in United States | 8,502 |

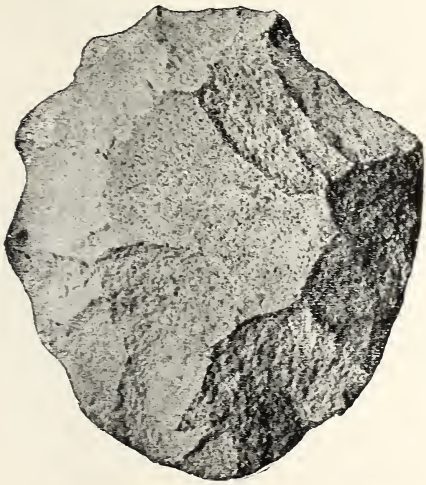
There is a question yet to be examined, whether certain leaf-shaped implements (see Fig. 15), the same being long, thin, and well-formed chipped points (spear-points), made frequently of the same material, and found associated with the ruder forms just described, may not also belong to the paleolithic period, but not to the same epoch. These may possibly be found to belong to a later epoch which corresponds with the Solutréen of Europe. This, however, waits further investigation.

## NEOLITHIC IMPLEMENTS IN AMERICA—INDIAN RELICS.

The civilization of the aboriginal occupants of the United States, whether mound-builders, or the red Indian in possession of the country at the time of its discovery has been assigned to the neolithic period. Many copper implements have been found, and were used, but there was never such general use of that metal as to establish what might be called the epoch of copper. Stone does not appear to have been superseded as material for implements. This can not be attributed to scarcity of copper, but rather to its want of favor among the savages. They were about as difficult and tedious to make as were the stone implements, while, when made, they were much softer and more inefficient. Altogether, they do not seem to have possessed sufficient advantages over the stone implement to have displaced it. The principal objects and implements, whether tools, weapons, domestic articles, those for ceremony, gaming, and many for ornamentation, continued to be made of stone. Pottery was, of course, made and used to a great extent. Some domestic articles and many for personal decoration were of bone and shell.

Illustrations of types of these objects taken from the originals in the National Museum will be given in the following pages.

a



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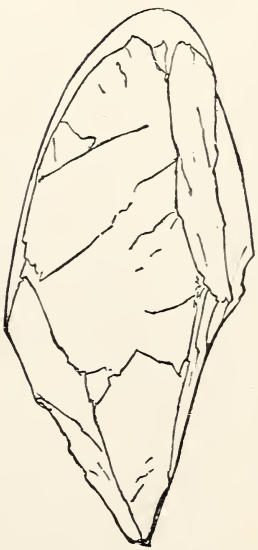
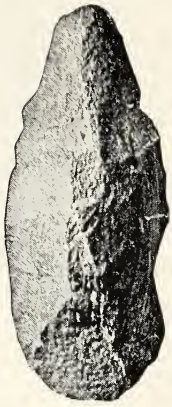


PALEOLITHIC IMPLEMENTS FROM THE DISTRICT OF COLUMBIA. (See page 630.)

(Half natural size.)

*a*



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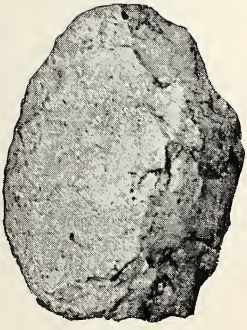

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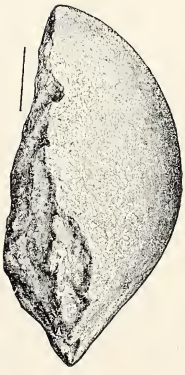
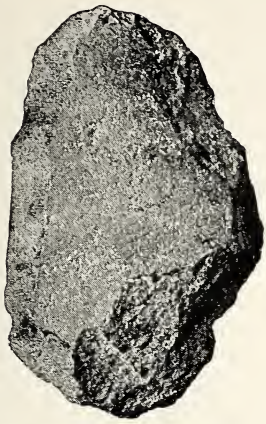


*e*

PALEOLITHIC IMPLEMENTS FROM THE DISTRICT OF COLUMBIA. (See page 630.)
(Half natural size.)

RUDE CHIPPED IMPLEMENTS FROM THE DISTRICT OF COLUMBIA. (See page 630.)
(Half natural size.)



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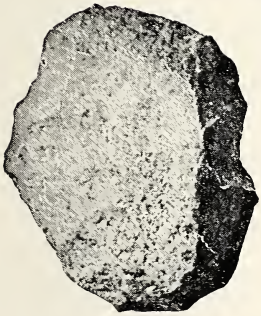

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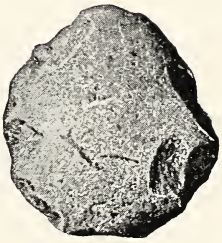

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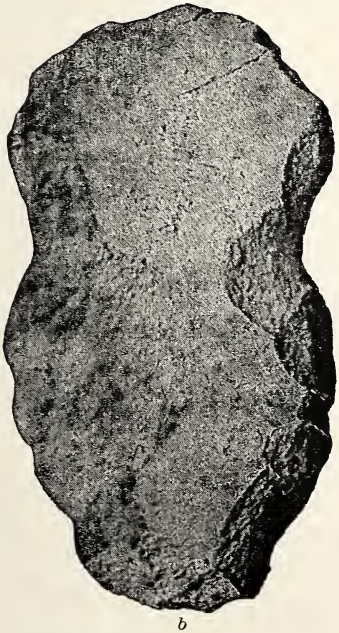

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RUDE CHIPPED IMPLEMENTS FROM THE DISTRICT OF COLUMBIA. (See page 635.)

(Half natural size.)

ARROW OR SPEAR-HEADS, OR KNIVES.

These are of almost every form, material, and size. With but slight differences in these qualities, they are found all over the United States, and are substantially the same as those of the prehistoric ages in all parts of the world. Their various uses, as indicated in the title, are not known with certainty in all cases. Their difference in size

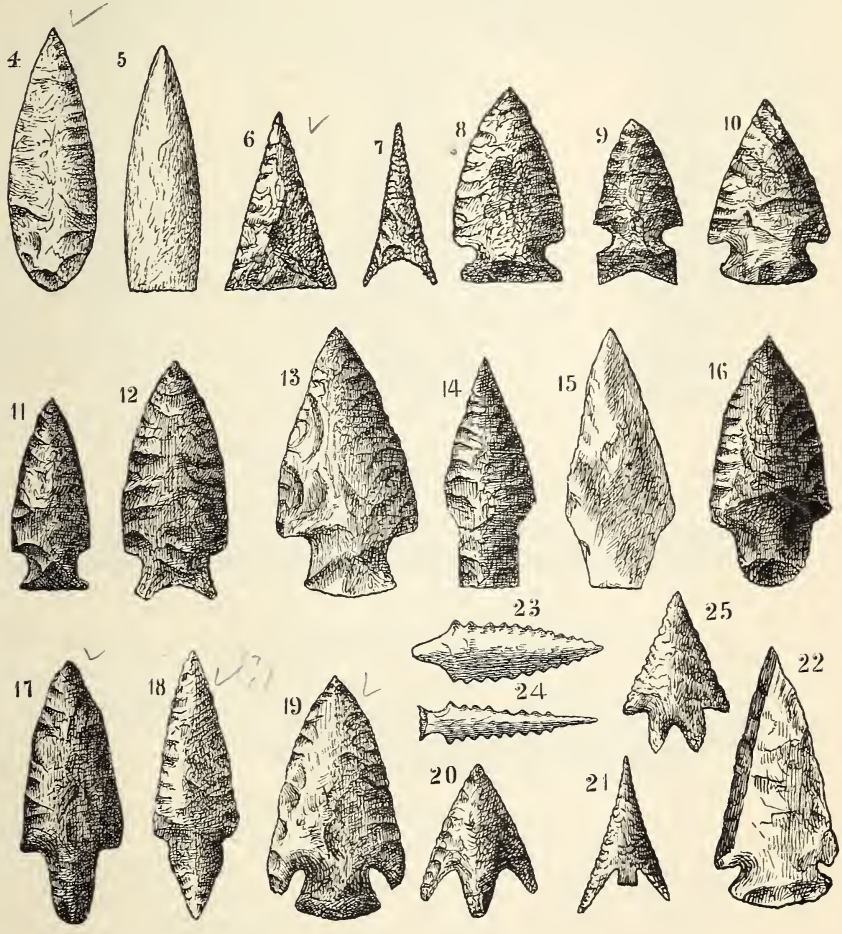


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Fig. 11.

ARROW-HEADS.

Different forms, from various localities in the United States.

seems to have indicated the difference in name. Except for this the same implement might have served as either arrow or spear-head or knife. A tang indicates attachment to a shaft or handle, and this, if found, would determine its purpose. Instances of this attachment occur on the Pacific slope, but in the eastern half of the United States specimens bearing such evidence are practically unknown. They might have been fastened with a cord, or with some adhesive substance.

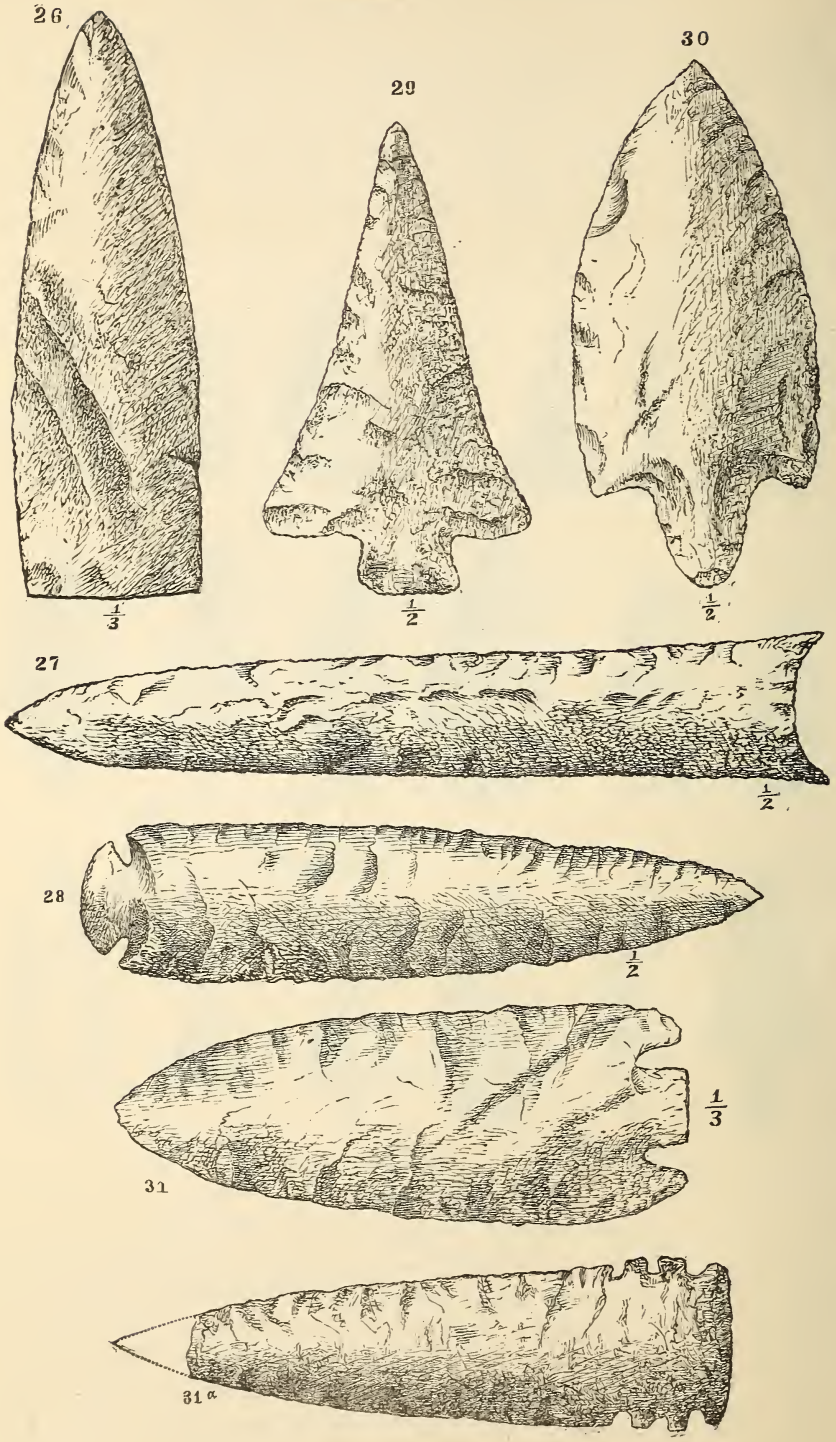



Fig. 12.

SPEAR-HEADS OR KNIVES.

Every finder should examine his specimens carefully for evidences of any sort of attachment, and if found the specimens should be forwarded for examination.

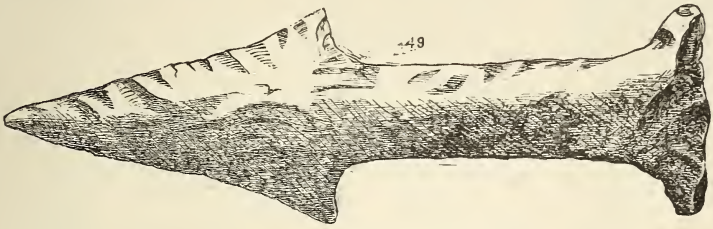


Fig. 13.
CHIPPED DAGGER OF GRAY FLINT.
(Cat. No. 9339, U. S. Nat. Mus. From a mound in Alabama. Collected by N. T. Lupton.)

The Museum possesses one specimen of a knife or dagger with the handle complete, chipped from a single piece of flint somewhat after the fashion of like implements from Scandinavia. It also possesses a dozen or more specimens of knives, principally from California, the handles being short, with the flint blade inserted and fastened with bitumen. In some cases the handle has been preserved, but in others the bitumen alone remains as evidence of the attachment.

Fig. 14.
FLINT KNIFE, attached to short wooden handle by bitumen.
(Cat. No. 14329, U. S. Nat. Mus. Southern Utah. Collected by Maj. J. W. Powell.)

The Museum possesses a specimen which has served as a knife, but without any handle being attached thereto; instead it is wrapped with a strip of otter skin. It is a large specimen, 7 inches long, 2½ wide, and one-half inch thick, and is leaf-shaped. It was collected by Capt. Philip H. Ray, U. S. Army, from the Natano band of Tinneh (?) Indians at Hupa Valley, California. It is of mottled obsidian, which is said to have come from Oregon. Captain Ray relates that these implements were held in great veneration by the old Indians, and that this had been used as a charm or talisman. In writing of the Hupas, Mr. Powers, in his "Tribes of California," says, page 79:

There are other articles paraded and worn in this and other ceremonial dances which they will on no account part with, at least to an American, though they sometimes manufacture them to order for one another. One of these is the flake or knife of obsidian or jasper. I have seen several which were 15 inches or more in length and about 2½ inches wide in the widest part. Pieces as large as these are carried aloft in the hands in the dance, wrapped with skin or cloth to prevent the rough edges from lacerating the hand, but the smaller ones are mounted on wooden handles and glued fast. The large ones can not be purchased at any price, but I procured some about 6 inches long at $2.50 apiece. These are not properly "knives," but jewelry for sacred purposes, passing current also as money.

## LEAF-SHAPED IMPLEMENTS.

These, or similar implements, generally called leaf-shaped, have been found nearly all over the United States, many times deposited intentionally in nests or *caches*, sometimes to the number of a hundred or more, placed on end or on edge, and together as close as they can stand or lie. It is curious to note that in that portion of the United States east of the Rocky Mountains we are practically without information concerning their use or purpose, whether they were used as spear-heads or knives; whether they were objects of ceremony, as mentioned by Powers above, or whether they were intended for practical use. No one knows whether they were used naked in the hand or were attached to a handle. Dr. Metz and Professor Putnam discovered in 1884 in the Mariott Mound, No. 1, Little Miami Valley, ten points of deer antlers, which were grooved or chamfered, so that they might have served as handles for these leaf-shaped implements. But no leaf-shaped implements were found in connection therewith. Of the ten handles one had a piece of bone inserted for a cutting or piercing implement, and another a bit of worked flint, but it was triangular, and had no relation to the leaf-shaped implements, and was to be classed among the arrow-heads of common form.

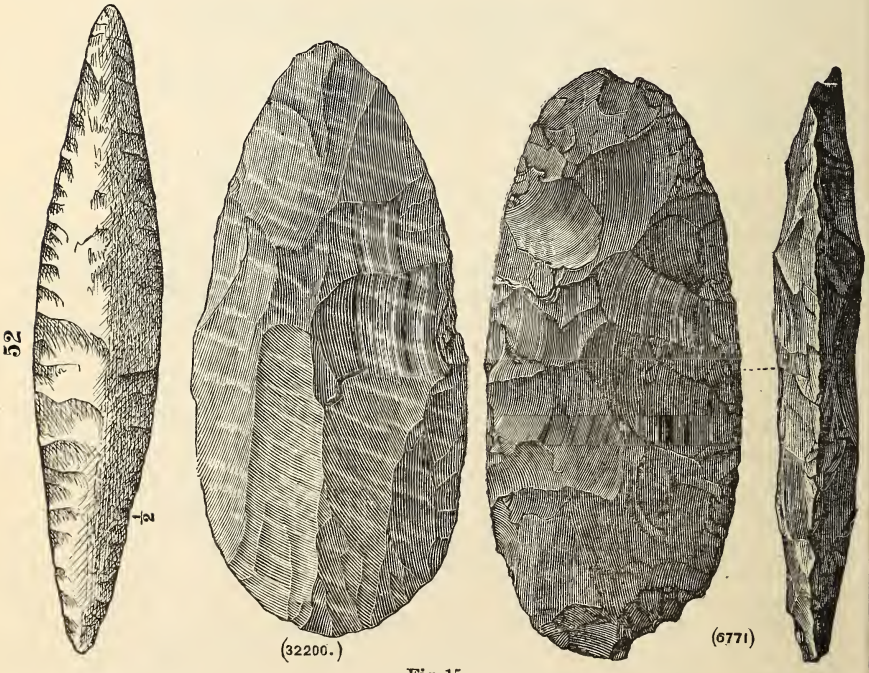
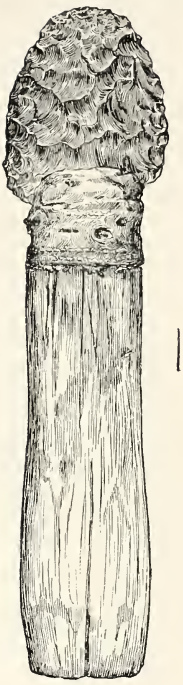



Fig. 15.
LEAF-SHAPED IMPLEMENTS.

These implements are found in plenty on the Pacific slope, but it is remarkable that in only two localities have they ever been found with their use indicated either by attachment to a handle or otherwise.

75.



76.

78.

79.

77.

HANDLED KNIVES. FROM HUPA RESERVATION, CALIFORNIA.

FIGS. 75, 76, and 77. Hafted knives, of jasper; wooden handles attached with bitumen. (Cat. Nos. 126527-8-9, U. S. N. M.)

FIG. 78. Obsidian knife; wrapped around one end with a strip of otter skin. (Cat. No. 126530, U. S. N. M.)

FIG. 79. Elk-horn wedge. See Smithsonian Report, 1886, Part I, Ray collection. Plate XVIII.

In the Hupa Valley, northern California, the locality of the implement last described, we have seen it with a strip of otter skin for a handle (Pl. CII, Fig. 78), but others to the number of six or eight were also collected by Captain Ray, which were inserted in a broad wooden handle and fastened with bitumen (Pl. CII, Figs. 75, 76, 77). Some were leaf-shaped and some were with a tang; some were found with handle attached, while others bore the traces of bitumen, but were without a handle. The other locality is southern California in the region and islands about Santa

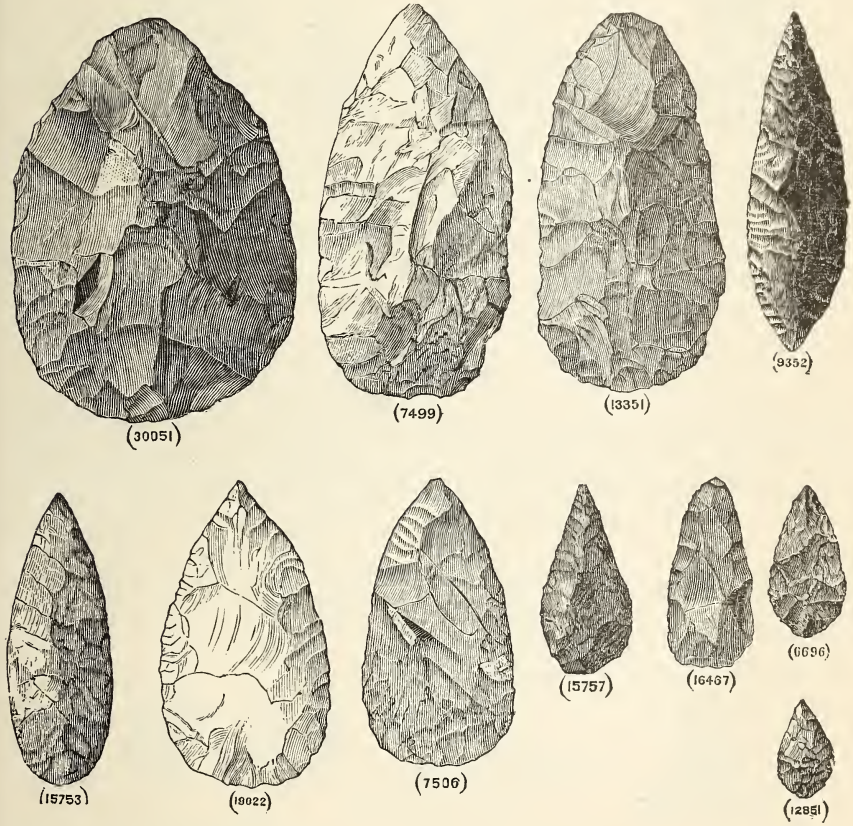



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FIG. 16.
LEAF-SHAPED IMPLEMENTS.

Barbara and the adjacent portions of Mexico. Here they have been found in burial places which appear to be, without doubt, prehistoric. The great archæologic interest of these leaf-shaped implements is that in Europe they belong to the paleolithic period, and are the type of the Solutréen epoch. They have been called in France *feuille de laurier*, laurel leaf. In America but a slight consideration has been given to them. They have always been considered as Indian, and the possibility of their belonging to the paleolithic period has never been contemplated.

It would become intensely interesting if, now that the attention of the public is directed to these implements, they should be found so associated with other paleolithic implements, or with the fauna, or under circumstances which would point to their belonging also to the paleolithic period.

NOTE.—Between the time of the preparation of this paper and the reading of its proof, I have prepared for the Museum, a classification of arrow or spear heads or knives, a short description of which is as follows:

LEAF-SHAPED.

Sub-class A: Thin and finely-shaped implements of the form of a laurel leaf; elliptical and pointed at both ends. They correspond substantially with the French Solutrian type of the paleolithic period of the stone age.

Sub-class B: These may be thicker and ruder than subclass A. Some are more oval, and the bases are not pointed, but are either straight or convex. The class includes the leaf-shaped argillite implements found by Dr. Abbott in the Delaware River gravels of Trenton, N. J.

Sub-class C: These are long, thin blades with nearly straight edges, more like a dagger or poignard. The base may be either convex, straight, or concave. Many of them show traces of attachment to a handle by means of bitumen or gum. They are peculiar to the Pacific Slope.

TRIANGULAR.

This class includes all forms approaching a triangle, whether the bases or edges be convex, straight, or concave. They are without stems, and consequently without shoulders, but in some specimens the concavity of the base produces barbs.

STEMMED.

This class includes all varieties of stems, whether straight, pointed, or expanding, and all varieties of bases and edges, whether convex, straight, or concave.

Sub-class A: Lozenge-shaped.

Sub-class B: Shouldered, but not barbed.

Sub-class C: Shouldered and barbed.

NOTE.—Nearly all of the convex bases are smooth, as though they had been worn. The purpose or cause of this is unknown.

PECULIAR FORMS.

These have such peculiarities as distinguish them from all other classes, but by reason of their restricted number or locality can scarcely form a class of themselves.

Sub-class A: Beveled edges. The bevel is usually in one direction.

Sub class B: Serrated edges.

Sub-class C: Bifurcated stems.

SCRAPERS.

Thick flakes of flint, obsidian, etc. Worked at one extremity to a convex edge. They were inserted in a handle and used for scraping any needed substance, but principally for dressing skins. Nos. 38 and 41 are from Texas; 39, 40, and 319 from Ohio.

Occasional specimens are found shaped more or less like No. 40, with a tang and barb much resembling in that regard certain arrow or spear

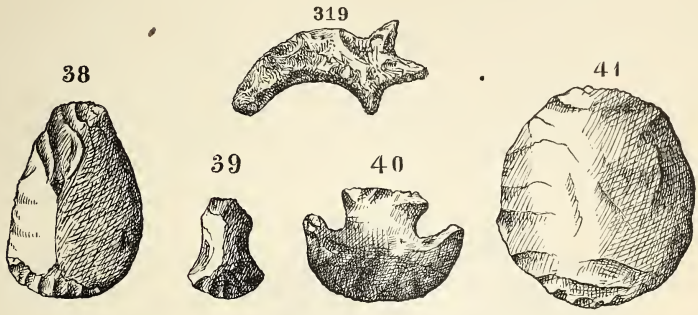



Fig. 17.
SCRAPERS.

heads, from a broken one of which it is supposed they have been made, thus serving a secondary purpose.

## PERFORATORS.

They may have served to drill the harder substances, but also softer materials, as wood, hides, bone, etc. But slight traces of usage are found. Their form has given rise to the theory that they were drills or perforators, and they may have been so used, but it is by no means certain, and they may have had another origin or purpose. Old Indians have declared them to have been charms or fetiches.

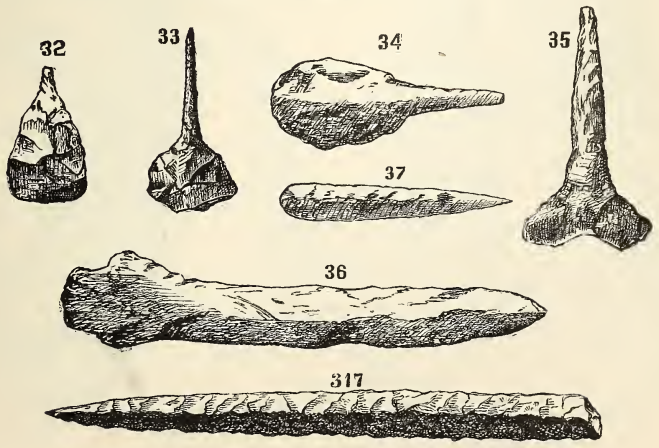



Fig. 18.
PERFORATORS.

Nos. 32, 35 are from Ohio; 33 from Oregon; 34 from Missouri; 36 from Tennessee, and 37 California. No. 7 is triangular, of brown flint from Santa Cruz Island, California.

HOES OR DIGGING TOOLS.

Dr. Rau describes these as "large, flat implements of siliceous material, usually ovoid in shape and sharp around the circumference. They are supposed to have been used as spades or hoes. The lower part is often smoothed by wear, appearing almost glazed." These are probably the largest style of chipped implements belonging to prehistoric times. The Museum possesses specimens 16 inches long, 6 wide, and 1 inch thick. I am not satisfied with the explanation of the smooth or

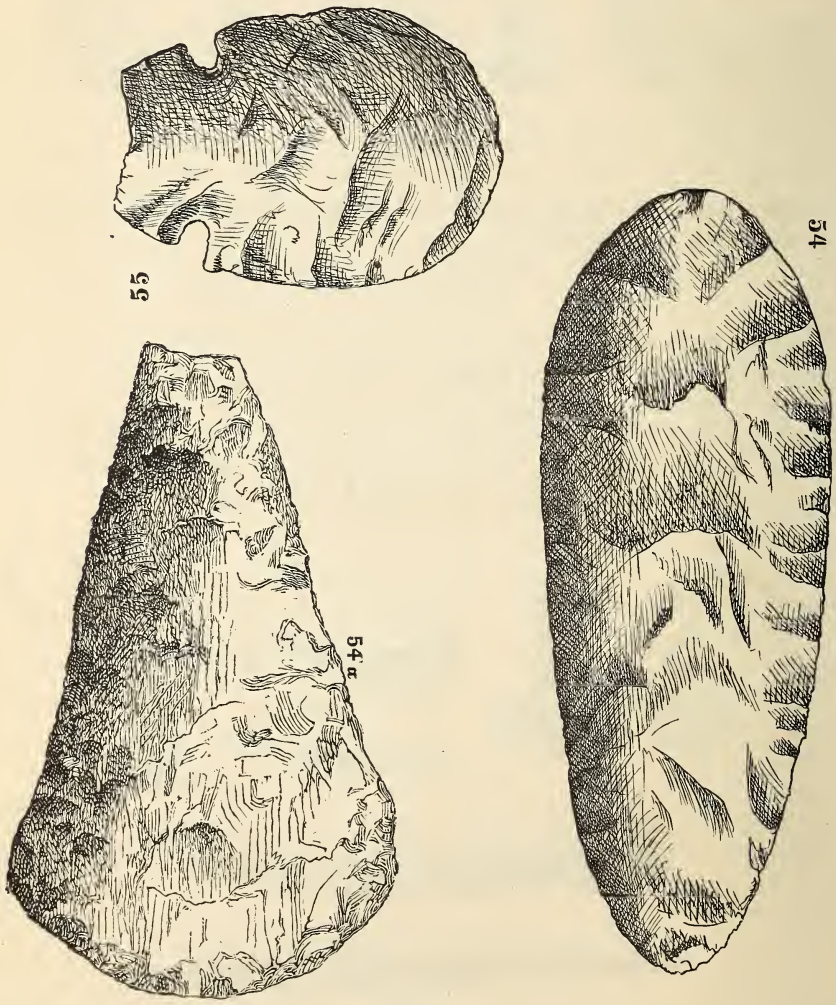



Fig. 19.
HOES, DIGGING TOOLS, OR AGRICULTURAL IMPLEMENTS (⅓).

polished appearance at the lower end. They may have been smoothed by use in digging, but many times the polish appears to be indicative of another origin.

No. 54 is from Tennessee; 54*a* and 55 are from Illinois.

## POLISHED STONE HATCHETS.

These are sometimes called celts, from the Latin word chisel, but they are not chisels, but chopping tools used as axes or hatchets. The correctness of the Latin word has been assailed, and the name is being gradually abandoned. They have been also called in the United States (I think improperly) fleshers. They are the standard implement representing the neolithic period, or polished-stone age. They were often made of flint, but any hard, close-grained, and tough stone in the locality would serve. They are substantially the same in form, size, and, subject to the above suggestion, the same material in all parts of the world. A series of these implements from the United States will not differ essentially from a like series of any other country. They were used as a hatchet, being inserted in a handle of wood; occasionally in a socket of deer-horn, which, in its turn, was inserted in a wooden handle. Specimens made of hematite are, I believe, peculiar to the United States.

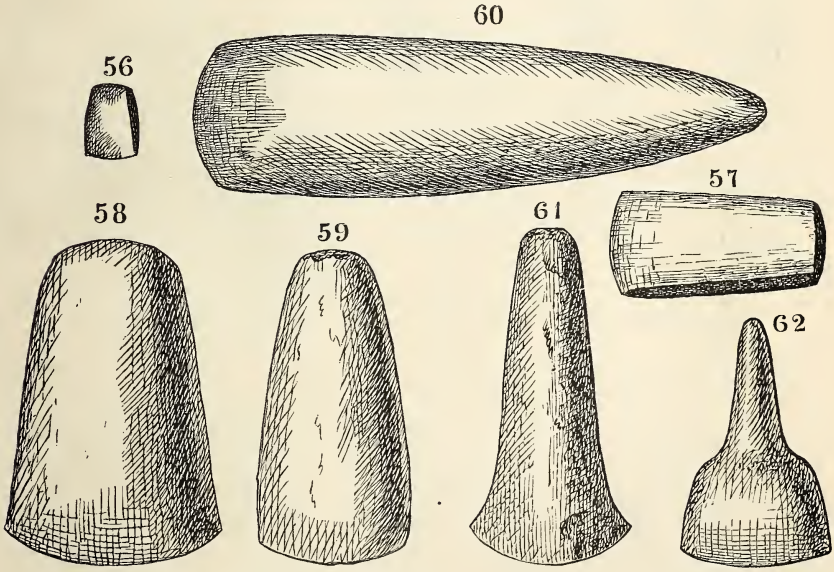



Fig. 20.
POLISHED STONE HATCHETS ($\frac{1}{4}$).

No. 56 represents a hematite hatchet from Ohio; 57, greenstone from Indiana; 58, syenite from Illinois; 59, greenstone, and 60, indurated chlorite slate, from Tennessee; 61 from Louisiana; 62 rare, from North Carolina.

## CHISELS, GOUGES, AND ADZES.

The chisels and gouges are similar to the polished stone hatchets just described, except the difference in form indicated by their name.

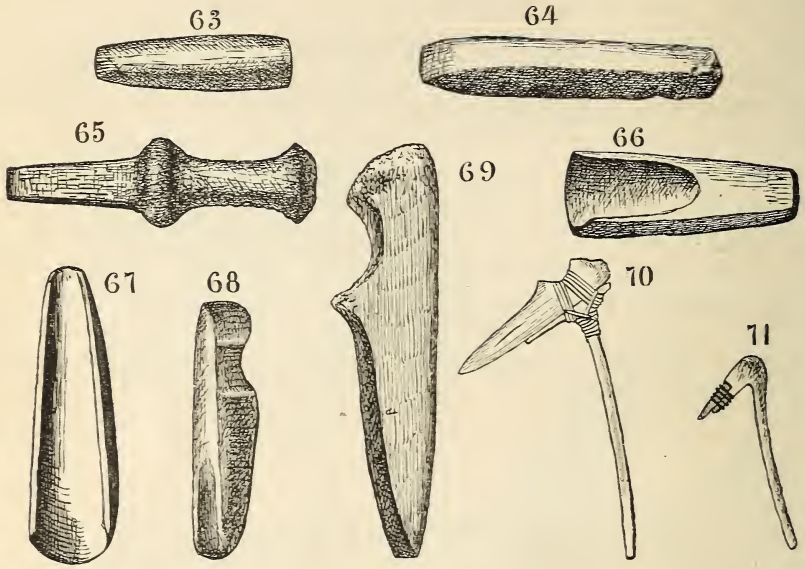



Fig. 21.
CHISELS AND GOUGES (principally from the Atlantic States). ADZES (from the northwest coast).

No. 63, diorite, from Ohio; 64, lydite, from Connecticut; 66, hornstone, from New York; 67, from Pennsylvania; 68, greenstone, from Massachusetts. Of the adzes 69, 70, and 71 are from the northwest coast.

## GROOVED AXES, HAMMER HEADS, AND HAMMER-STONES.

The grooved axes are peculiar to the United States. They are not found at all, or rarely, in European countries. They were used with a handle, which was attached by means of a withe or thong which passed around in the groove. They were of nearly all sizes, from 2 inches in length, weighing 3 or 4 ounces, to one in the Museum from Illinois 13 inches long, 7½ wide, and weighing 20½ pounds. The different styles are shown by the figures. No. 72, greenstone, is from Massachusetts. The average size and weight was from 5 to 7 inches in length and weight 1½ to 2 pounds. No. 73, greenstone, is from Arizona; 74, greenstone, is from South Carolina; 75 is from Wisconsin; 76, greentone, is from Alaska; 77, graywacke, is from Pennsylvania.

*Hammer-stones.*—The largest number of these are simply pebbles or broken stones which have been used by holding in the hand. Their broken and battered corners and edges, pecked and roughened by numberless strokes, are the only evidence of their use. Some large and

heavy specimens show a groove, as do the axes, which have served for the attachment of a handle. These are called mauls. No. 78, granite, Colorado, weighs 11 pounds. Many specimens which have been named hammer-stones are flat or oval pebbles, with an intentional worked de-

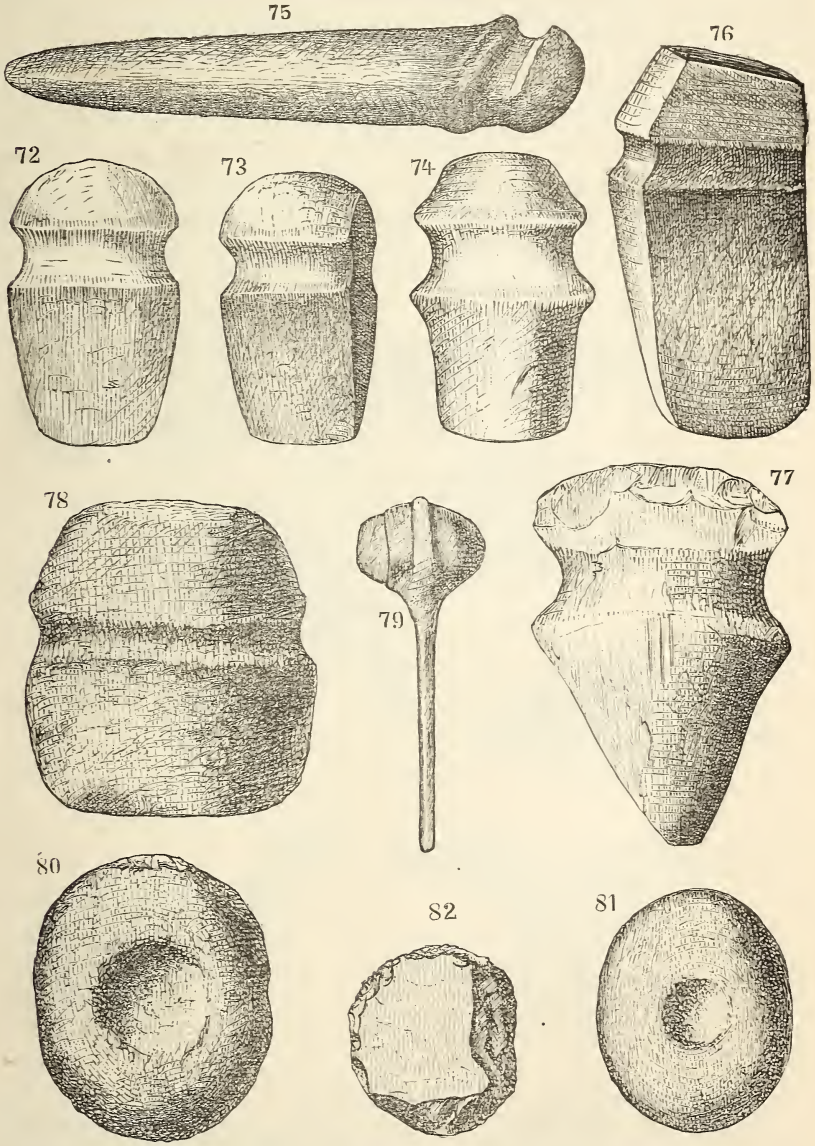



Fig. 22.
GROOVED AXES AND HAMMER STONES. (Nos. 72 to 77, ¼ size; Nos. 78, and 80 to 82, ⅛ size.)

pression in the center of sometimes one, sometimes both, sides. These implements have been found over a large portion of that world which belonged to prehistoric times. They are supposed to have been used

in the mines. This is practically the only grooved implement found in Europe. The Brothers Siret found similar implements in the mines of southeastern Spain. The British Museum has some specimens from the English mines.

No. 79 is a weapon or implement belonging to the modern Indians, a quartzite pebble weighing 2 pounds, incased in rawhide, which continues and is sewed around the withe which forms the handle.

## ORNAMENTS, CEREMONIAL AND DECORATIVE OBJECTS, GAMING IMPLEMENTS.

There are a great number of objects widely different in form and material, but which, with all their differences, may be classed together. They have largely passed out of use by the modern Indians, and their

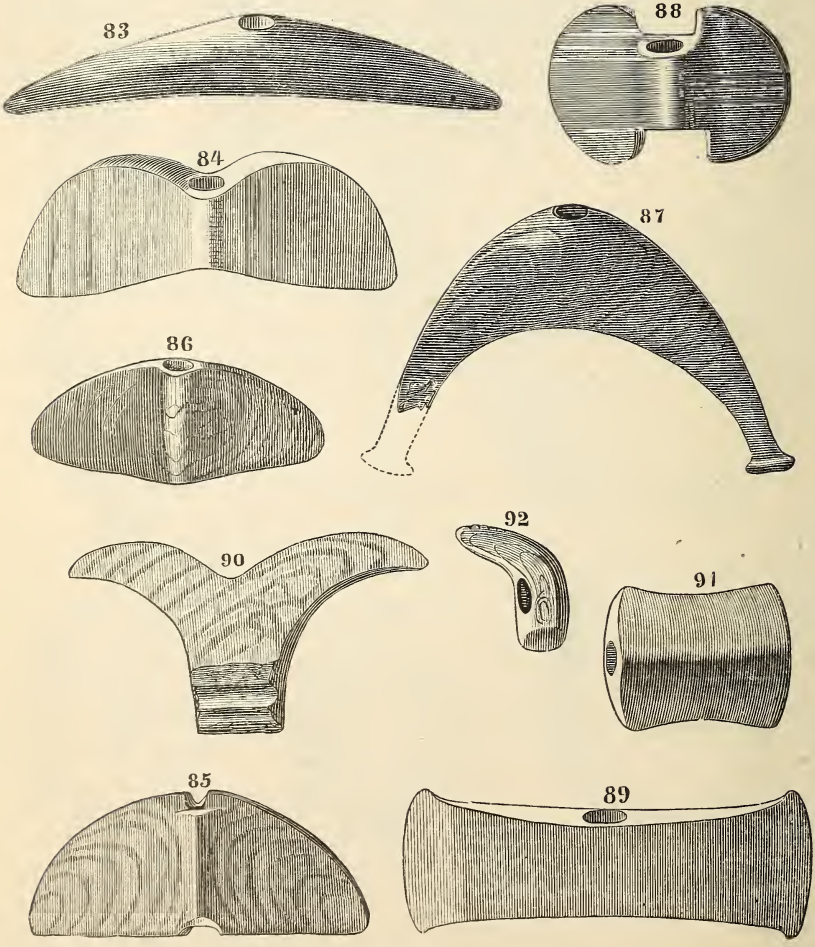



Fig. 23.

BANNER-STONES, OR DRILLED CEREMONIAL WEAPONS (⅓).

actual purpose is unknown. Divers names have been given to them, all of which have been based upon a theoretical idea of their purpose or because of their appearance. Some have been called banner-stones, some drilled ceremonial weapons, some pierced tablets, others gorgets, pendants, bird-shaped objects, boat-shaped objects, etc. The names thus given may or may not be correct, but are as good as others that have been suggested in their stead. They should be retained until something more correct can be given. They are all supposed to fall within the category given in the title above.

*Banner-stones, or drilled ceremonial weapons.*—These are for the most part symmetrically shaped and well polished. Their material is generally a soft kind of stone, principally slate, ofttimes banded. They are all drilled with a small hole. These holes have apparently never been used, for their edges (as well as the corners of the implements) are as fresh and sharp as the day they were made, showing no trace of usage. They have been drilled apparently with a hollow reed, and the annular striæ is frequently to be seen. Many specimens are found partly made, then broken and rejected. These show that they had been shaped approximately before the drilling commenced.

No. 84, of serpentine, is from Pennsylvania; 85, striped slate, from Wisconsin; 86, striped slate, from Indiana; 87, striped slate, from Pennsylvania; 90, striped slate, from Indiana; 92, striped slate, from Indidiana; 88, brown jasper, from Louisiana; 91, translucent ferruginous quartz, from Indiana.

*Pierced tablets and boat-shaped articles.*—These are mostly made of slate, the greenish striped variety having been preferred. The tablets are flat and thin; the holes may be drilled from one side or from both, and are accordingly of a conical or biconical shape. They bear no trace of usage. The same remarks apply to the boat-shaped articles, except as to the difference in shape.

No. 127, slate, from New York; 128, slate, from Pennsylvania; 129, from Louisiana; 130, 131, 132, slate, from Tennessee; 133, potstone, from Pennsylvania; 134, striped slate, from Ohio; 135, greenstone, from Kentucky.

*Stone beads, pendants, and other ornaments.*—Stone beads are found of different forms and material. No. 200 is serpentine, from Santa Barbara, California; Nos. 201 and 202 are of soapstone, from Pennsylvania; 204, catlinite, from New York; 203 is a straight tube nearly 3 inches in length, from Mississippi, beautifully drilled with a small hole its entire length. It is of a siliceous material resembling yellow jasper. A manufactory of beads of this material was discovered in Lawrence County, Miss., in the spring of 1876, and four hundred and forty-nine specimens were sent to the Museum by Mr. T. J. R. Keenan. An account of this find was given in Smithsonian Report for 1877, pages 293–298.

Another specimen, 211, striped slate, from a mound in Ohio, much larger and longer, not drilled lengthwise, but diagonally across the corners, may have served the same purpose of ornament, as likewise 212, which is of fine-grained argillaceous sandstone, from Kentucky.

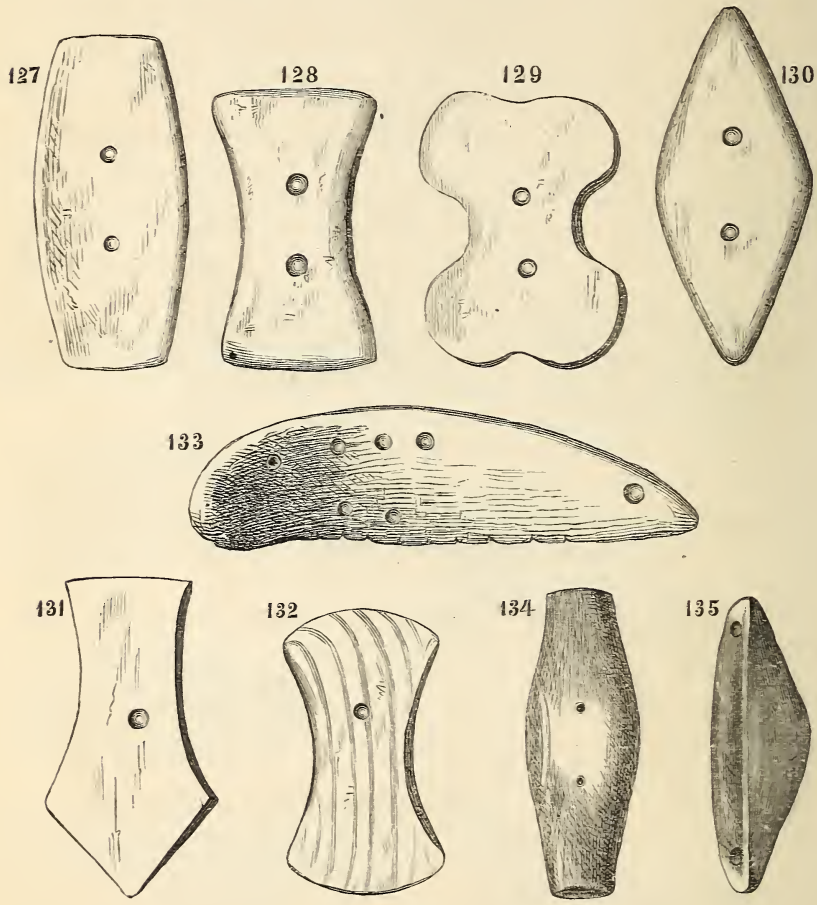



Fig. 24.

PIERCED TABLETS AND BOAT-SHAPED ARTICLES (⅓).

*Pendants.*—No. 205 is of trap rock; 206 a flat sandstone pebble, from Rhode Island; 207, same, from Pennsylvania; 208, same, Virginia; 209, argillaceous slate from a mound in Ohio, where it was found lying near the neck of a skeleton.

*Bird-shaped objects.*—Though this name has been given to numerous relics from their general resemblance to birds, their shapes are so various as to leave the design often uncertain. Some specimens more resemble the fence-lizard, and the eyes are frequently indicated by small, round protuberances. The objects are generally of soft stone, such as

the favorite green-striped slate; yet sometimes syenite and other hard substances have been employed.

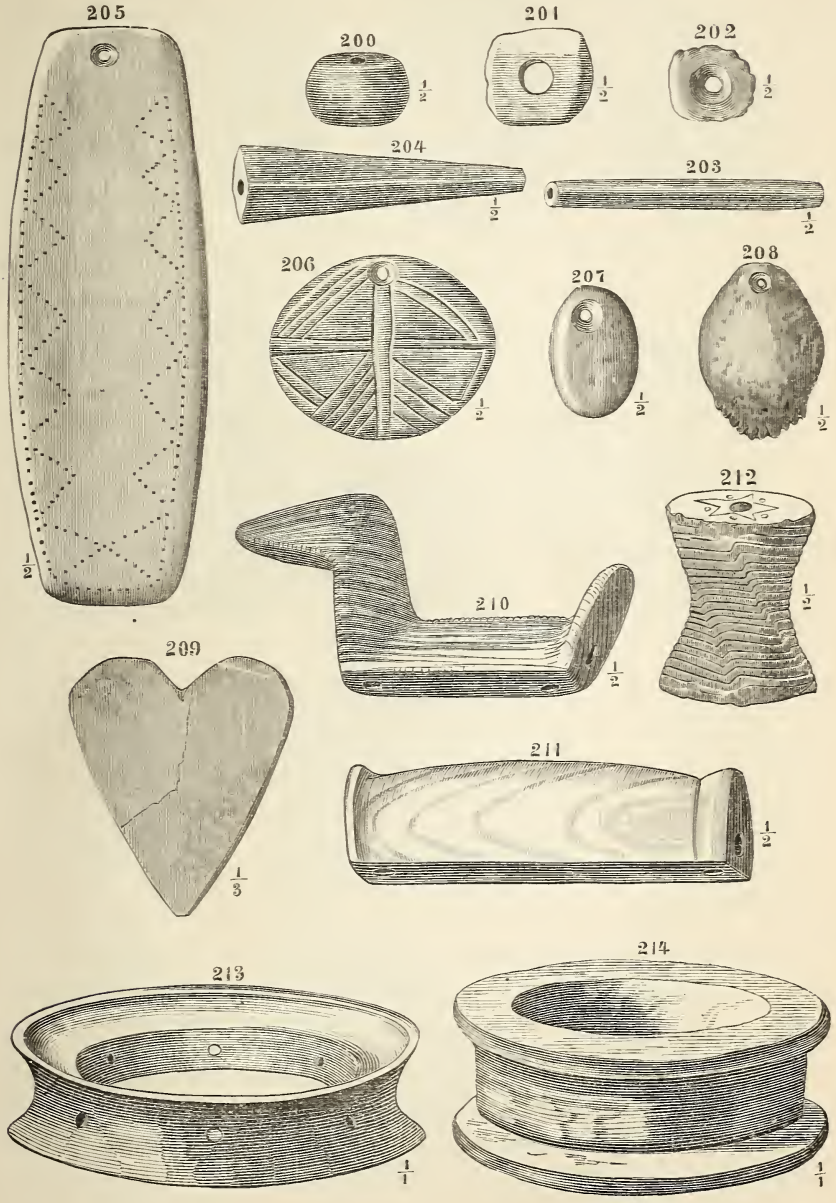



Fig. 25.

Stone Beads, Pendants, and other Ornaments.

No. 210 is striped slate from Pennsylvania. Small holes are drilled from the bottom and end, respectively, diagonally so as to meet and

form a continuous hole. The purpose of these have been for a long period unknown. A Chippewa Indian told me, in the Smithsonian Institution, last summer, that they served for gaming. They were placed in a pan or basket, which, being covered, was shaken and then set down quietly, the cover removed, and an inspection would show how many of the birds were seated upright. The player having the greatest number thus won the game.

*Plummets and sinkers* (Fig. 26).—These are analogous in name, and possibly sometimes in appearance, to the pendants just described; but an examination of the real object in the number as possessed by the Museum shows such differences as that they can not be classed together. Taking the last numbers on Fig. 26 for first description, Nos. 111 and 113 are of quartzite, from Pennsylvania; 112 is of graywacke, from New York. They are simply flat pebbles with notches chipped out on opposite sides to receive a cord or thong. Another variety, but of the same class, are pebbles more nearly round, which are still in their natural state, but have been grooved around the circumference. No. 104 is greenstone, from California; 107, granite, from Rhode Island: 108, soapstone, from Georgia; one with two grooves at right angles is 109, talcose slate, from Rhode Island; while No. 110 is sandstone, from Oregon, and is decorated with engraved lines. The latter may have served as an ornament. These specimens show a substantially different purpose from the gorgets or pendants (No. 205 *et seq.*), and it is alleged were used as plummets or sinkers, but on that opinions differ. No. 107 may possibly have been used with a handle and served as a weapon. The others, Nos. 100 to 105, are totally different from the pendants, and have been manufactured into their present state. They are of hard material, red or brown hematite, jasper quartz, greenstone, etc., and are made with grooves, knobs, or holes, apparently all for suspension. Their form would indicate them to be plummets. They much resemble the modern plummet, but their actual use is unknown. No. 100 is hornblende, from Ohio; 101, hematite, from Tennessee; 102 is from Arkansas; 103, greenstone, from Ohio; 105 is quartzite from Massachusetts; 106, greenstone, from Massachusetts. This class are supposed to have served as sinkers for the nets of prehistoric fishermen, but nothing more is known with certainty than is indicated by their appearance.

*Discoidal stones* (Fig. 27).—These are supposed to have been used for games among the Indians, probably in playing the game called "chungkee." It resembles the modern game of quoits, except that the stones are rolled on the ground instead of being pitched through the air. Some of these discoidal stones measure 6 inches and more in diameter with a regular dish-shaped cavity on each side. Their material is always hard and is often ferruginous quartz. They are carefully made, evidently with great labor; their outline is regular and true, and they have been rubbed and polished smooth.

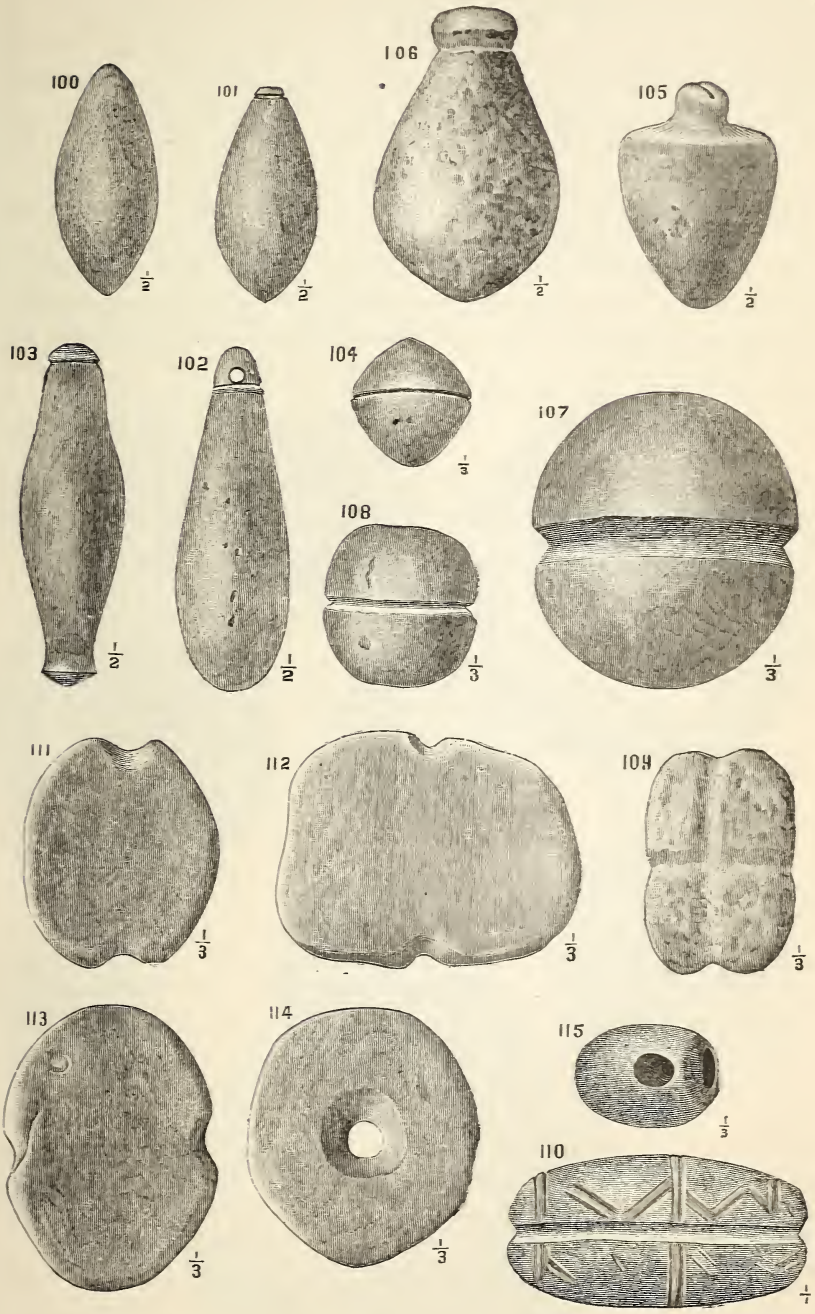



Fig. 26.
PLUMMETS AND SINKERS.

No. 116 is yellow-brown ferruginous quartz, from Tennessee; 117, brown ferruginous quartz, from Tennessee; 118, dark greenstone, from a mound in Illinois. In some specimens the cavities on the sides are carried deeper than in others, and their center marked by a perforation. Nos. 119 and 120 are quartzite, from Ohio. Other specimens are without the dish-like cavity. No. 121 is quartzite, from Georgia. Some specimens, similar in every other appearance, are diminutive, scarcely more than an inch in diameter. No. 122 is argillite, from Pennsylvania; and curious to remark, relics presenting the same appearance have been made of broken clay vessels, which, except the hole, resemble the spindlewhorl. The writer found a specimen of this kind in a prehistoric workshop in Brittany, France. It has been suggested that they were used as paint cups, and possibly this may be true.

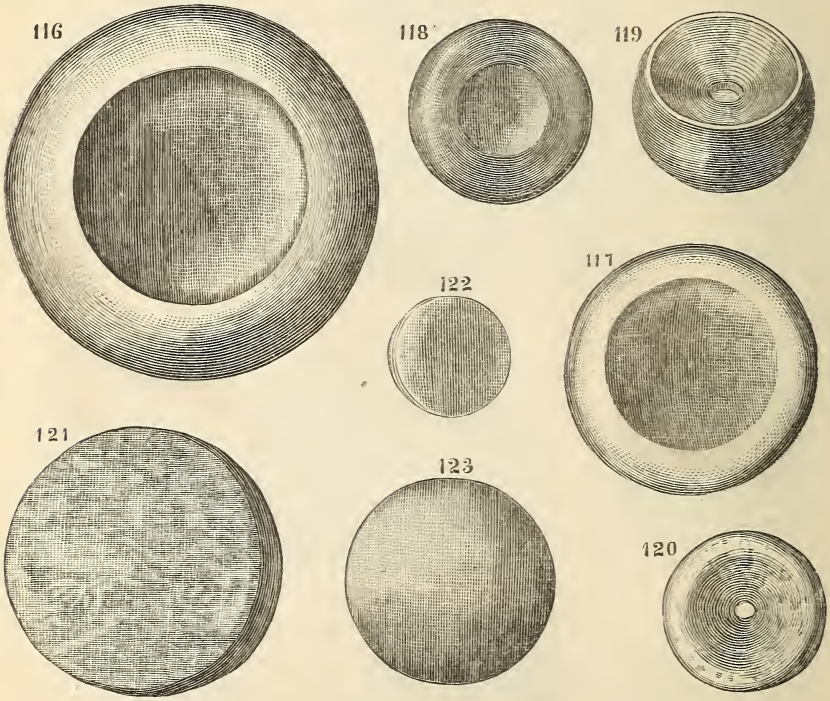



Fig. 27.
Discoidal Stones (⅓).

When in Italy I remarked a game which had a great similarity to the chungkee of the Indians. In 1889 I wrote to my friend, R. Mancini, for a description, which he gave in the following:

LETTER FROM R. MANCINI, ORVIETO, ITALY, TO MR. WILSON.

* * * * * * *

The play, made by rolling discs at a mark, which you saw in one of the streets outside the city of Orvieto, has several names. It is called Ruzzola, or Ruzzoletta when played by the children with small discs; but if the play be by adults and with large discs it is called Ruzzolone, or sometimes Giuoco del Formaggio, or Play of the Cheese, because when played by the peasants or shepherds they use their discs of

cheese, betting one cheese against another. It is usually played by two persons, but may be by four. They divide themselves into opposite parties, and each one alternately throws the cheese or the disc, rolling it on its periphery at the distant mark or peg.

The discs are generally of hard wood. Sometimes the children, for economy, make them of terra-cotta, and also sometimes, but rarely, of stone. The small discs are from 7 to 12 centimeters in diameter, while the large ones are from 18 to 20 centimeters.

The following are the principal rules of the game:

Choice is made by "odd and even" as to which party shall have the first play. The line or point of departure is fixed by consent, and here the player stands to roll his disc. The goal or mark for its arrival is also fixed, and he whose discs rest nearest the mark or line is declared the victor.

This play dates from high antiquity, and is believed to be the modern repetition of the ancient classic game made known generally by the antique statue of Discobolus.

In excavating the ancient tombs I have found terra-cotta discs placed as covers for amphora in crematory burials, but which appeared to have been first used as discobolo.

*Perforated stones—club-heads or riatta.*—The discoidal stones of the perforated kind pass by degrees into the ring form, a type exemplified

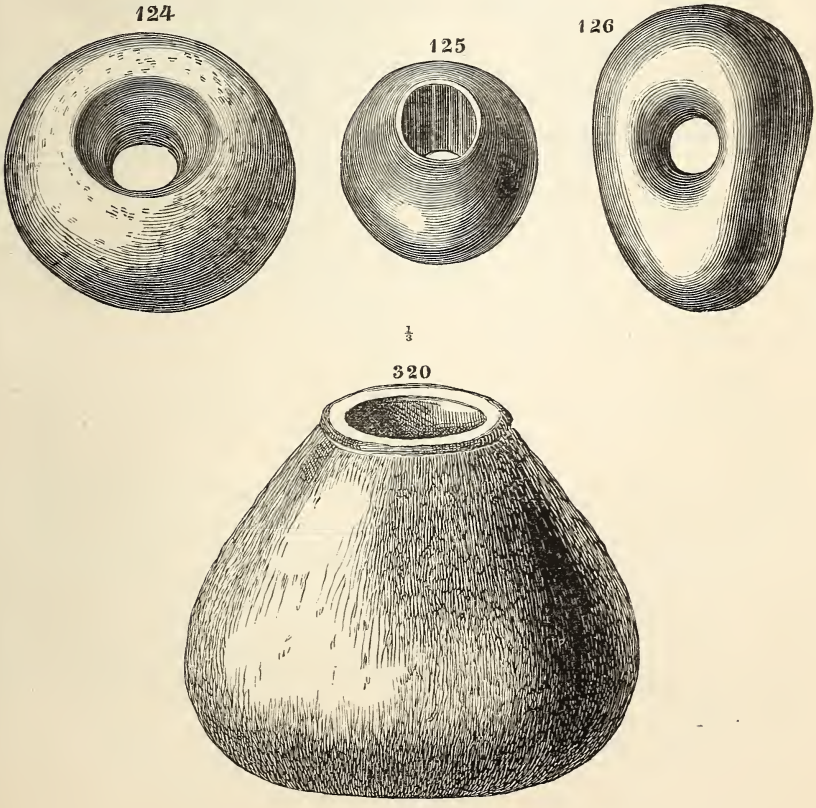



Fig. 28.
PERFORATED STONES—CLUB HEADS OR RIATTA.

by a large number of specimens from southern California. Their material is sandstone, serpentine, soapstone, etc., though occasional specimens have appeared of a harder material like greenstone. They vary much in size and character. They are from 1½ inches in diameter to 5 inches and more. Some are only half an inch in thickness, while others are so thick as to equal their diameter, almost forming a globe. Some are pear-shaped; others, with the globular form like No. 125, have their holes drilled the same size all through. They are occasionally decorated, and may have served as heads for a club or staff. Specimens with a staff 5 feet long have been found in California and Mexico, and also in New Zealand.

No. 124 is hornblende, from Santa Catalina Island; 125 greenstone, and 126 serpentine, from Santa Rosa Island, California.

Evidences of usage are to be seen in specimens resembling 124, 126, and similar objects are used in Mexico called riattas. A lariat is passed through the hole in the stone and stretched, and is polished and smoothed by the stone rubbing back and forth.

## CUTTING-TOOLS, SCRAPER AND SPADE-LIKE IMPLEMENTS.

*Cutting tools.*—No. 93 is of black slate, from Pennsylvania; 94, hard red shale, from Pennsylvania; 95, from Indiana. Implements similar to these are used on the northwest coast for opening fish. (Fig. 29.)

*Scraper and spade-like implements.*—These have been classed as axes, but an examination shows them more likely to have served as scrapers or spades. They are of large size, hard material, and scarcely enough examples have been found to establish them as a class. They are possibly abnormal specimens. No. 96 is greenstone, from Kentucky; 97, from Arkansas; 98 and 99, from South Carolina.

## STONE VESSELS FOR CARRYING OR HOLDING LIQUIDS—COOKING AND GRINDING UTENSILS.

Vessels like a pot or platter were made and used by the aborigines. East of the Rocky Mountains they were made of soapstone; while on the western side the material used was much harder. Soapstone quarries have been found in many parts of the United States where these utensils had been manufactured by the prehistoric man. Uncompleted vessels and those in fragments are frequently found. They were many times made of a size and depth sufficient to hold, and if need be cook, liquids. (Figs. 30, 31, 32, 33.)

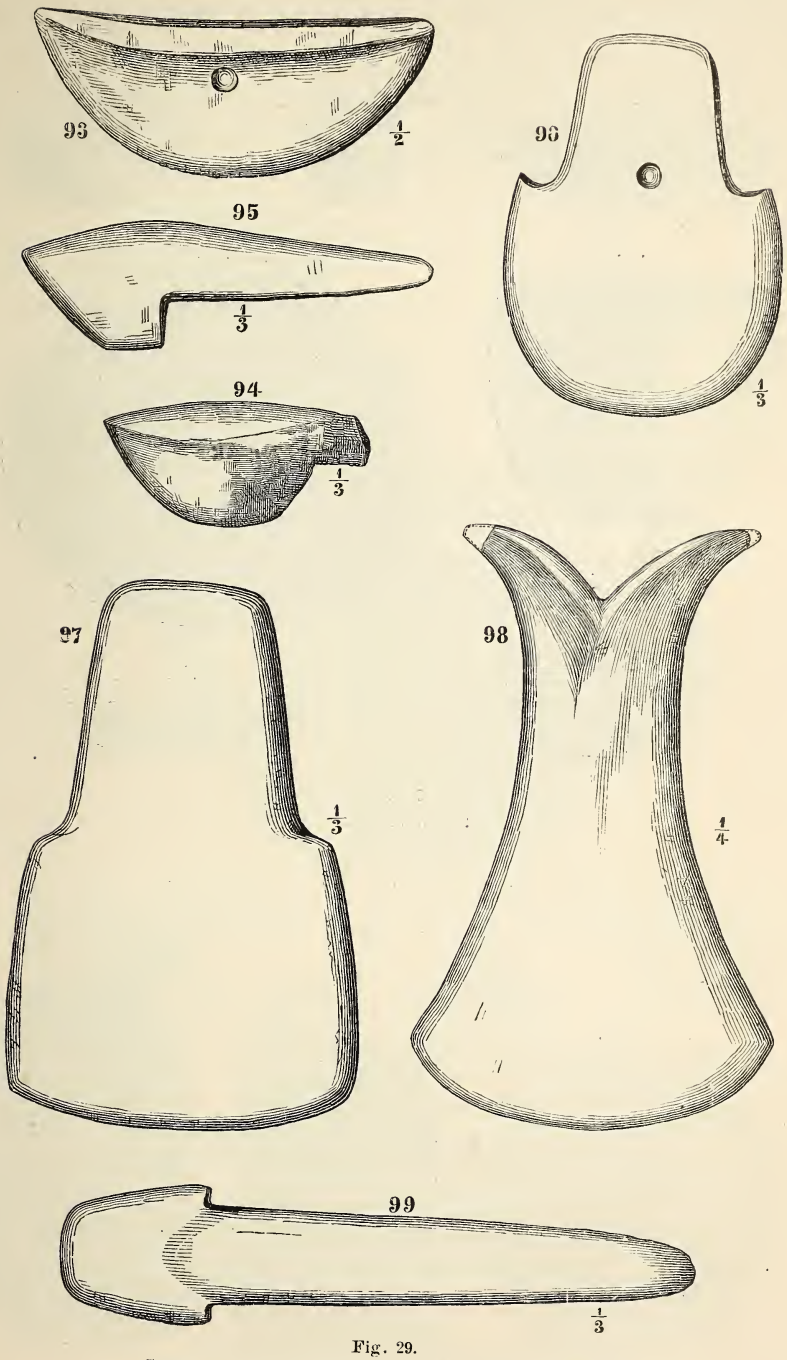



Fig. 29.
CUTTING TOOLS, SCRAPER, AND SPADE-LIKE IMPLEMENTS.

Others were in the shape of plates, and as such could be used to fry and broil.

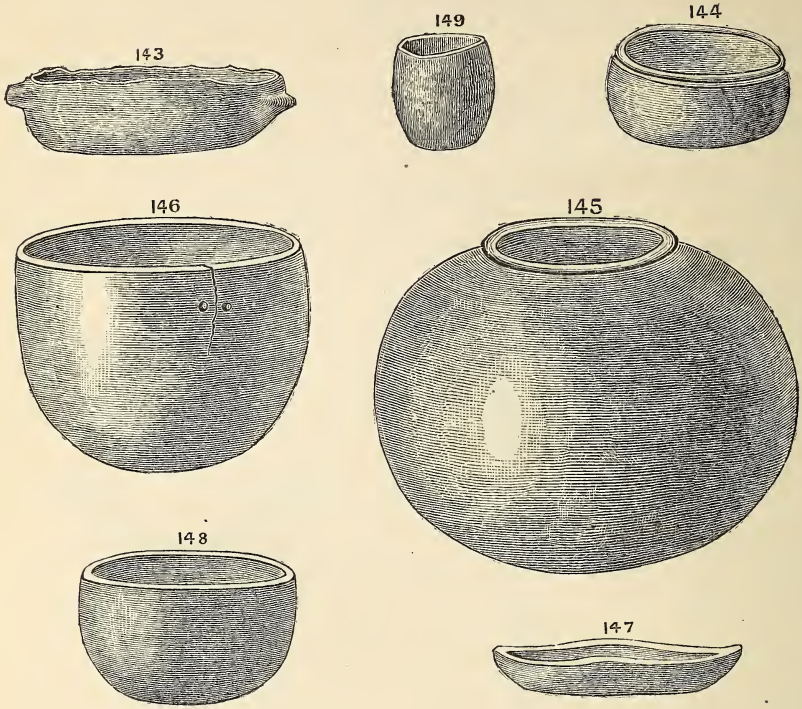



Fig. 30.
STONE VESSELS ($\frac{1}{6}$).

Nos. 150 and 151 are of graywacke from a mound in Alabama; 152 is of soapstone, from Santa Cruz Island, California.

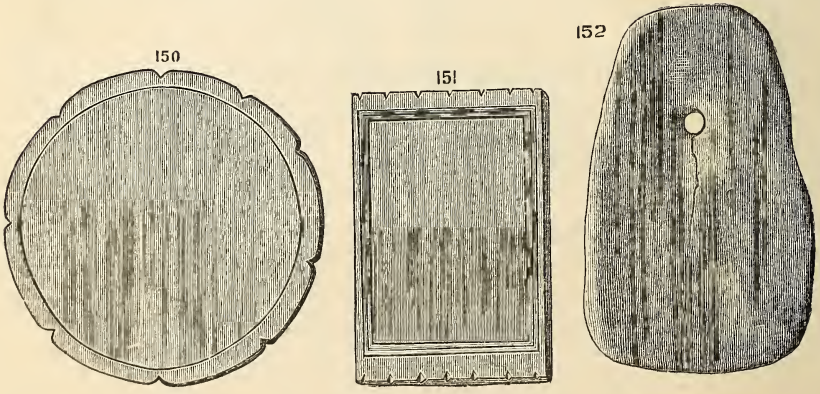



Fig. 31.
STONE PLATES OR PLATTERS ($\frac{1}{6}$).

Mortars are of varying dimensions and shapes. The best specimens come from California. Nos. 153, 154, and 155 are all from San Nicolas Island, California; 156, Dos Pueblos, and 157, from Santa Cruz Island, California. Nos. 158 and 159 are stone slabs used for grinding (the process being indicated in the figure) after the fashion of the Mexican Indian metate. They are from Utah and New Mexico.

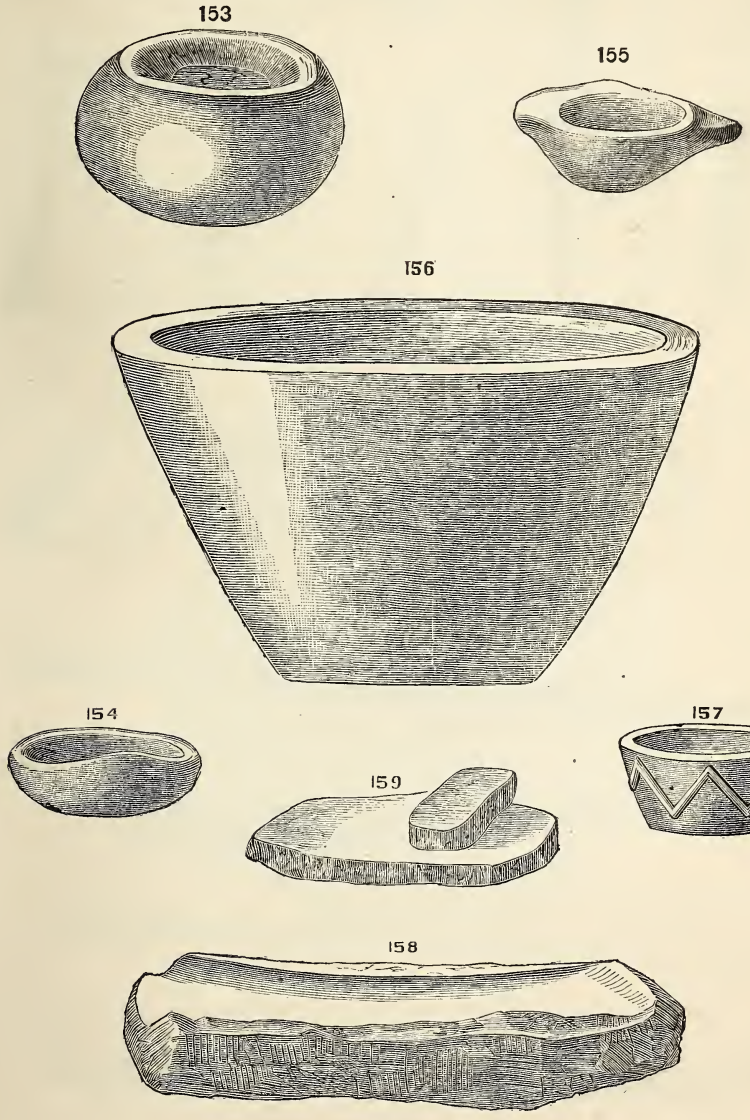



Fig. 32.
MORTARS.

A mortar without a pestle would be of but slight use. Many specimens are found. While the greater proportion of those in the Museum

come from the Pacific coast, yet the Eastern States are by no means unrepresented.

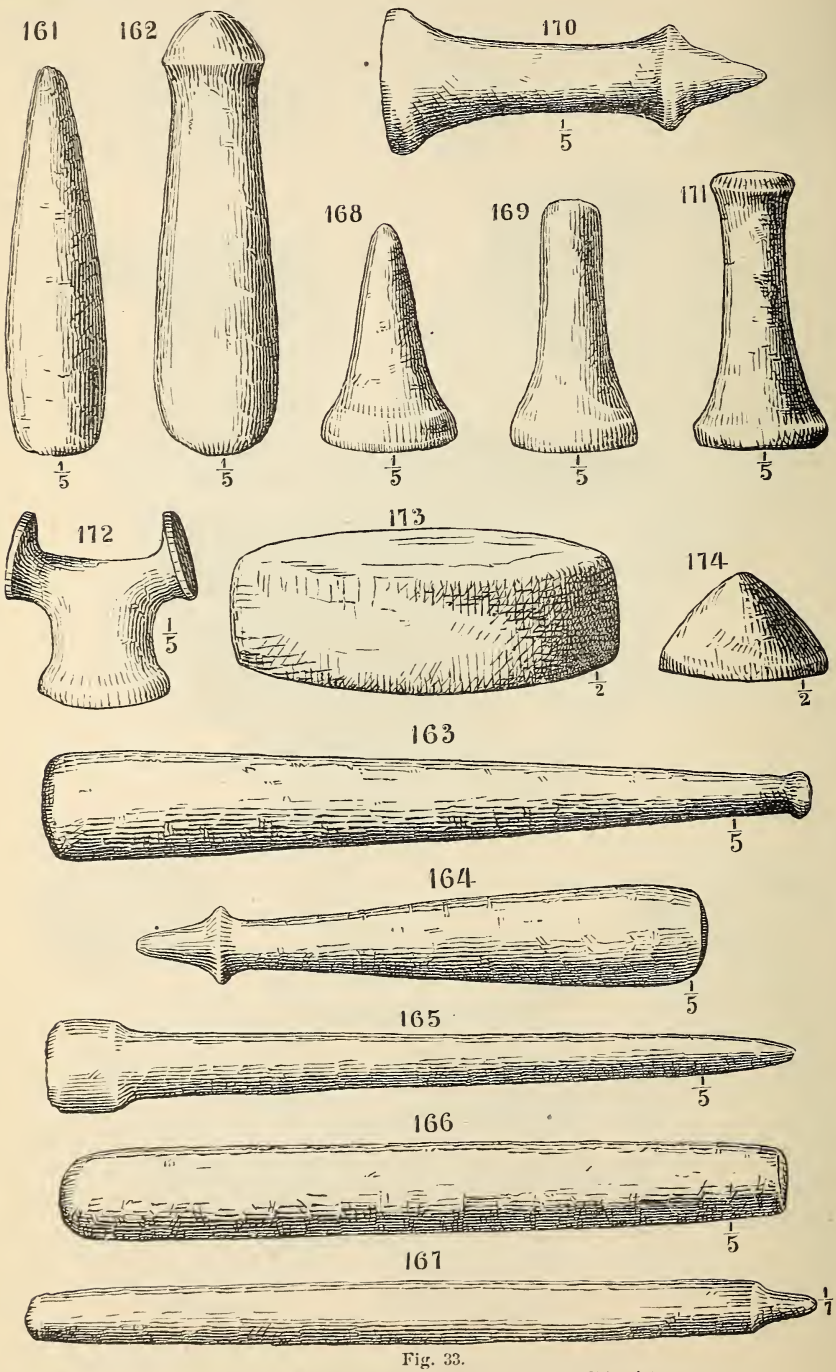



Fig. 33.

PESTLES AND HAMMERS (principally from California).

No. 161 is of syenite; 162, 163, 164, 165 are from California; 166 is fine-grained sandstone, from Rhode Island; 168, greenstone, from Pennsylvania; 169, syenite, from Ohio; 167 is from Alaska, 2 feet 5 inches long, of greenstone. Nos. 171 and 172, from the Pacific coast, are labeled as hammers with which to drive wedges to split wood. Dr. Rau says:

There is a class of small conoid-shaped mullers made of hematite, which may have been used for rubbing paints (No. 174, greenstone, Ohio).

## ROCK SCULPTURES OR PICTOGRAPHS.

These represent sometimes human, sometimes animal, forms, and sometimes forms which can not be identified. They may have been made by scratching, pecking, or cutting. Occasionally they are colored. The figures are often large and complicated, and could only have been produced by long-continued labor, which, from their position (many times on naked rocks, high up on a precipice), was not unaccompanied by danger. Their position should be noted by the observer; when possible, sketches should be made and the discovery reported to the Smithsonian Institution.

*Cup-stones.* These are small cavities wrought by pecking in the surface, sometimes of the solid rock, and again in bowlders and pebbles.

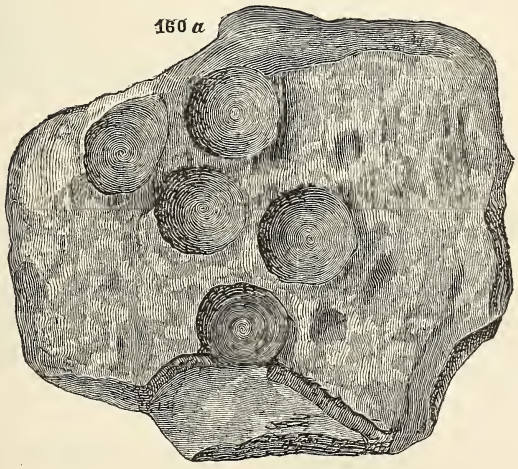



Fig. 34.
CUP-STONE.

They, like the rock-sculpturing, are distributed almost over the entire globe, and have been found in regular lines or diagrams high up on the face of the rocks in the Himalaya Mountains. They have been found on large bowlders among the Alps and all over Europe; also on the stones composing the megalithic monuments of prehistoric man, where the cavities are often polished smooth. They are numerous in Scotland and England on pebbles or small bowlders, and equally so in

the United States. They are found in abundance in Ohio. Their use or purpose is entirely unknown. The subject forms an interesting study. Dr. Rau published an interesting monograph thereon, entitled, "Observations on Cup-shaped and other Lapidarian Sculptures," contributions to North American Ethnology, vol. v, etc. He inclines to give them a religious rather than a utilitarian character.

## PIPES AND SMOKING TUBES.

No class of aboriginal productions of art exhibit a greater diversity of form than do the pipes of the prehistoric man of North America.

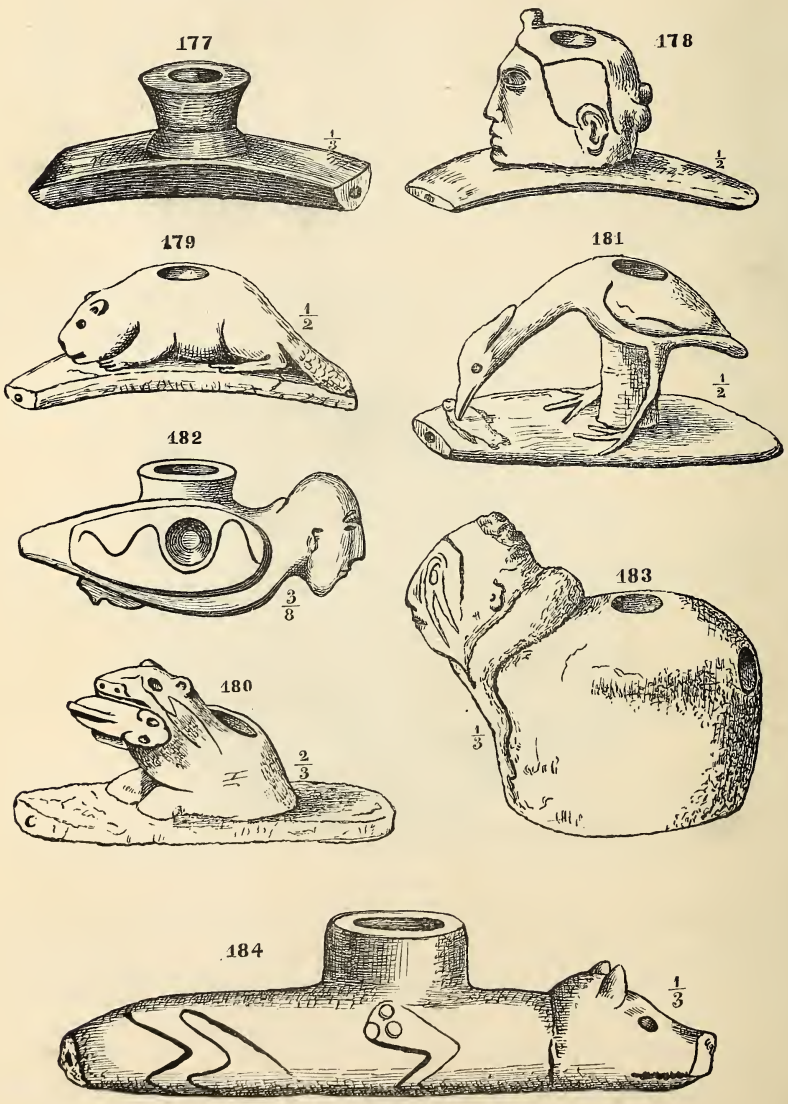



Fig. 35.
STONE PIPES.

They are chiefly carved from stone, but not unfrequently were molded in clay.

Messrs. Squier and Davis, in their explorations of mounds in Ohio, discovered many curious and interesting types. They were supposed at one time to have been made of hard stone, a kind of porphyry, but later examinations and scientific analyses have shown them to be of softer materials, composed of slaty and calcareous minerals.

Nos. 177 to 184 represent types of those found by Squier and Davis.

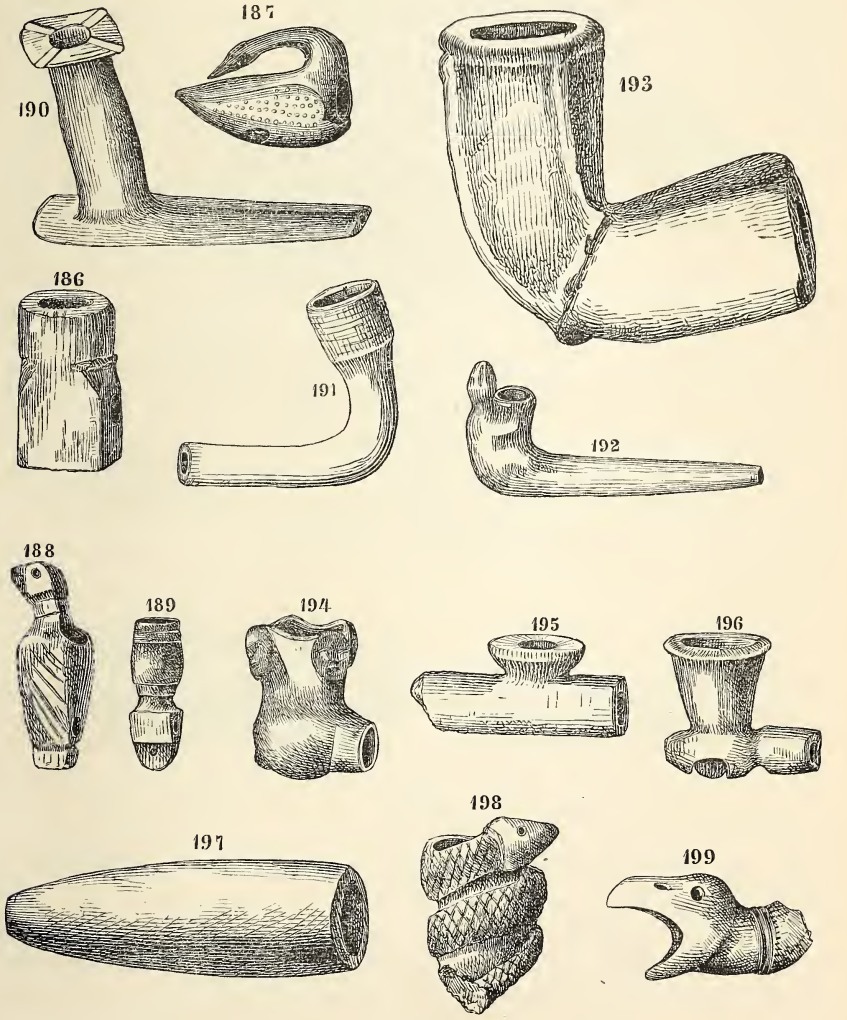



Fig. 36.
PIPES.

No. 186, argillaceous stone, from Pennsylvania; 187 represents a loon, and is of serpentine, from West Virginia; 188, from New York; 189,

from Ohio; 190, from Virginia; 191, serpentine, from New York; 192, steatite, from Pennsylvania, highly polished, representing a lizard; 193, soapstone, from North Carolina; 194 is from Texas; 195 from a mound in Kentucky. The latter is of compact limestone, and evidently of high antiquity. Its form is somewhat peculiar, in that it is the favorite among those who manufactured pipes from the catlinite or red pipestone, and has been continued into recent times. No. 196 is from Georgia; Nos. 198, 199 are made of clay, and were both found in Madison County, New York.

Stone pipes of entirely different character are found in California. They are represented by No. 197, of serpentine, from Santa Barbara County. These were in the form of tubes of various sizes and lengths, some of which are very large. Specimens have been found with a piece of bone inserted in the tapering end and cemented with bitumen for use as a mouth-piece, after the fashion in amber at the present day.

Allied in appearance to the California pipes are tubes which may have served as pipes, though neither in the instrument nor in the hole drilled therein is there apparently any provision for insertion in the mouth. The hole through the tube is sometimes biconical, having been drilled from both ends, and is smaller in the center, but quite too large at either end for the mouth. It has been suggested that these wide-mouthed pipes might have had two reeds inserted, which, being cemented with bitumen, were smoked through the nose. The smoke would thus be inhaled into the lungs, and so have a more powerful intoxicating effect. This, if true, might account for the small size of the bowl in many Indian pipes, a smaller quantity of tobacco being required in this than in the usual mode of smoking.

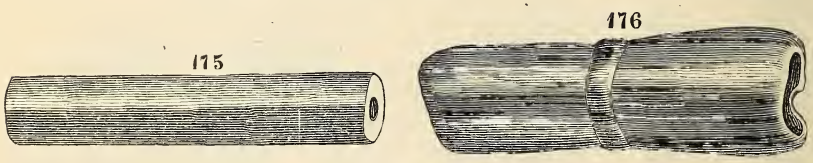
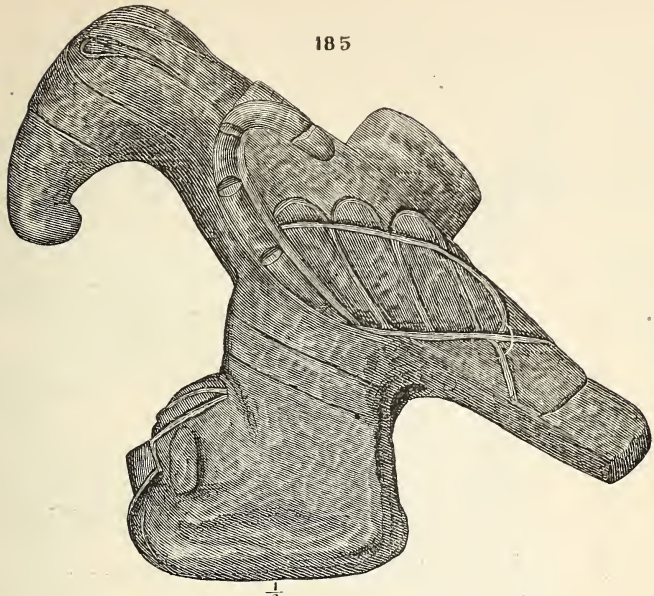



Fig. 37.
TUBES (½).

The material was soapstone, slate, and chlorite. Nos. 175 and 176 are from Tennessee.

The name "calumet pipes" has been given to those of large size smoked with a stem and representing usually a bird, animal, and sometimes a human figure. They are thus called by the Indians on account of their bulk and their use on occasions of great ceremony.

No. 185 is one of the finest possessed by the Museum, and is from Kentucky.




$\frac{1}{3}$

Fig. 38.

CALUMET PIPE.

(Cat. No. 16697, U. S. N. M. Received from the Kentucky University.)

## BONE IMPLEMENTS.

The adoption of bone instead of stone for the implements of the prehistoric man differed widely in different countries. It is difficult to give satisfactory reasons therefor. It has been said that bone implements were not made in the United States, because the stone was so easily obtained. But in France, where bone implements are in greatest profusion, the flint suitable for chipping, and of which the finest implements could be and were made, was to be found, and is still very abundant. Bone, horn, and ivory were used indiscriminately, and served, according to the need, as perforators, points, harpoons, fish-hooks, etc, They were often drilled, and so formed objects of suspension, ornaments, etc. Hollow bones might serve as tubes. They might be also sawed to serve as rings or beads of varying size and length. One of the most interesting varieties of implements in bone are those found almost only at the prehistoric cemetery at Madisonville, Ohio, by Dr. Metz and Mr. Low. Any discoveries made, information obtained, or specimens found of scientific interest should be reported. (Fig. 39.)

## COPPER IMPLEMENTS AND ORNAMENTS.

Implements and ornaments of this metal are shown in figure 40. They need not be described; their appearance will be sufficient. The remarks concerning the fraudulent character of some specimens sought to be foisted upon museums and collectors, and the necessity for the greatest care concerning the preservation of proofs and of genuineness, apply with even greater force to copper implements than to those of stone.

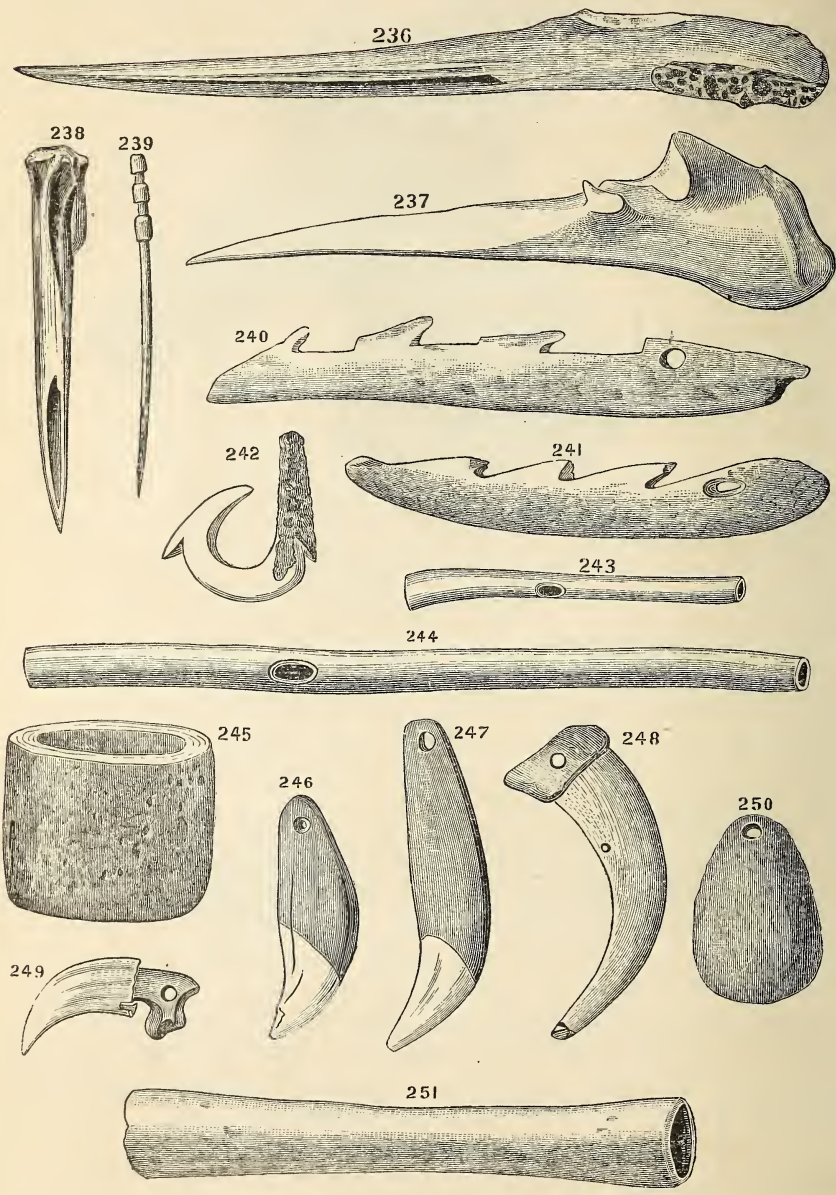



Fig. 39.
Bone Implements ($\frac{1}{2}$).

Fig. 40.
COPPER IMPLEMENTS AND ORNAMENTS FROM THE UNITED STATES.

## HUMAN REPRESENTATIONS.

Occasionally, though rarely, specimens of sculpture representing the human face or figure have been found in the United States. Those represented in the cuts are mostly from Mexico, but they will serve as illustrations. In consequence of their rarity and the superior art displayed, they have been much sought, and these with representations of

Fig. 41.
HUMAN REPRESENTATIONS.

animals have been subjects of fraudulent manufacture. The fortunate finder of such a specimen should take every means possible, by the calling of witnesses, identification of the precise locality, the preservation, if possible, of the matrix or bed in which it is found, and by any other means, to preserve the evidences of its authenticity and genuineness.

SHELL IMPLEMENTS AND ORNAMENTS.

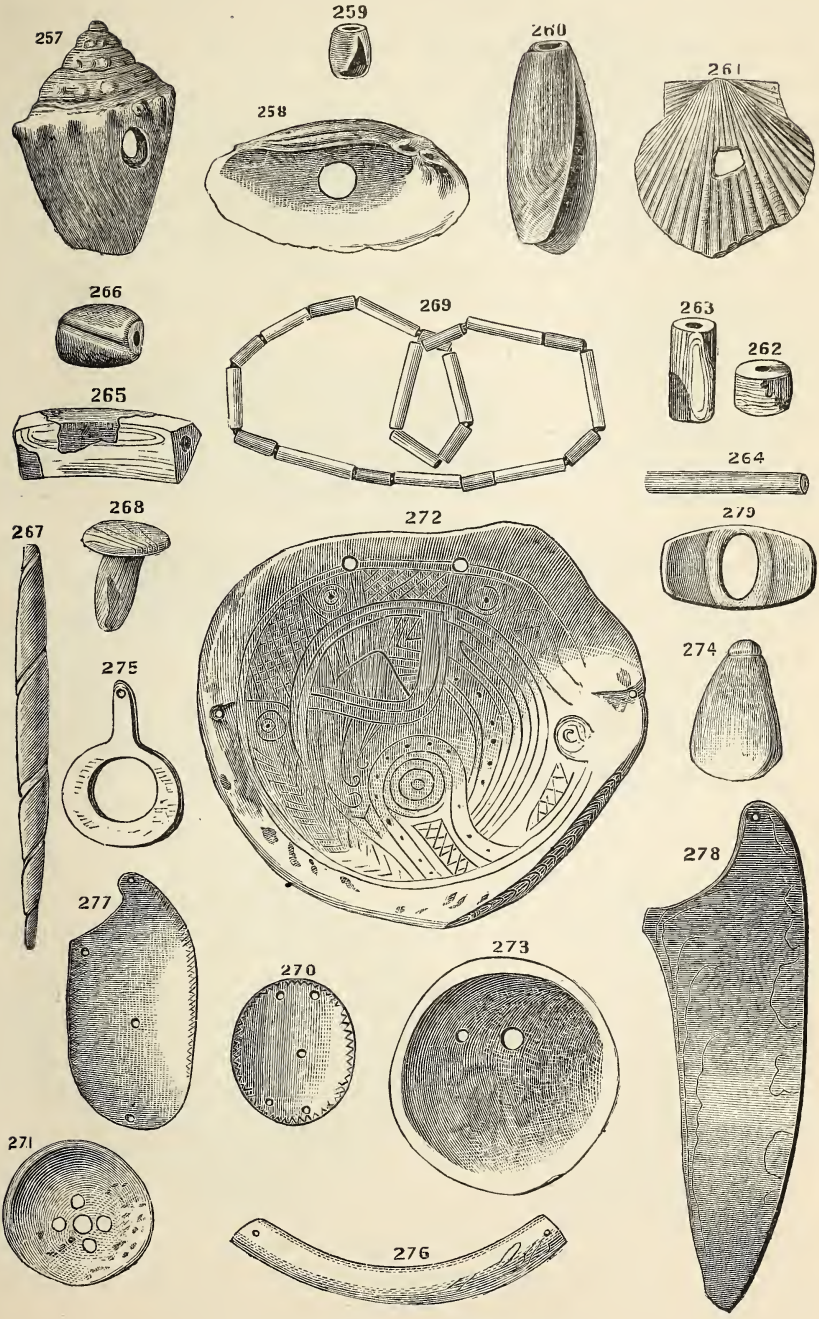



FIG. 42.—Shell implements and ornaments (⅔).

The various shells of the rivers and ocean furnished a material of great value to prehistoric man, and one which he could without much labor apply to a variety of uses. Small shells were perforated and used as beads; others were cut from the clam and mussel shells, which furnished the wampum. The haliotis was ground from the back and center so as to form bracelets. The same ornament made in the same way has been found in great numbers by the brothers Siret in their late discovery in southeastern Spain. The most interesting, as well as artistic, of the ornaments made from shell are the gorgets, which are especially noticeable for their engravings. They are sometimes cut so as to represent, upon the outside, a human face, but many have been found beautifully engraved in elaborate designs much resembling the mythologic art of Mexico and Central America. No. 272, found in Tennessee, represents one of these.

## POTTERY.

The prehistoric pottery of Mexico and Central America forms a special group; that from the Pueblos of Arizona and New Mexico, another; while that made by the North American Indian constitutes a third group. Each of these has distinctive characteristics.

The pottery of the North American Indian is in some respects like the dolmen pottery of Europe, although it differs in many details of form, mode of manufacture and ornamentation. The North American Indian used neither wheel nor furnace, nor did he, except rarely, decorate it with colors. The clay was frequently mixed with pounded shells. The decoration of pottery made in the eastern portion of the United States was effected by incised lines and dots, with various combinations. The spiral and volute were employed. Among the Southern Indians much of the decoration was made by the impress of textile fabrics, sometimes with only a string or cord. In the interior, and principally on the Mississippi River, the pottery vessels were made to represent sometimes the human form, sometimes animals. There was a much greater prevalence of the bottle-form in the United States than in Europe.

Prof. W. H. Holmes, of the Bureau of Ethnology, has written an interesting monograph upon aboriginal pottery in the United States, and the late Col. James Stevenson described the Zuni and Pueblo pottery. Both these papers have been published in the Reports of the Bureau of Ethnology, and are profusely and elegantly illustrated.

The following are given as specimens of what may be found in mounds:

No. 280 is from a mound in Tennessee; 281 from a mound in Illinois; 282 from a mound in Union County, Kentucky; 283 a mound in Tennessee; 284 a mound in Arkansas; 285 a mound in North Carolina; 286, which is a bright red and the only one painted, is from a mound in Tennessee; 287 is from a mound in Louisiana.

FIG. 43.—Pottery ($\frac{1}{4}$).

# ANCIENT INDIAN MATTING—FROM PETIT ANSE ISLAND, LOUISIANA.

By Thomas Wilson.

In the hall devoted to the collections of prehistoric anthropology in the U. S. National Museum there is exhibited a mat of interlaced or woven reed or cane which has been claimed, by reason of its locality, condition, and association, to be evidence of the great antiquity of man, and as tending to establish his existence during the tertiary geologic period.* Plate CVII.

The label affixed to this specimen tells its whole story.

Specimen of ancient matting from Petit Anse Island, near Vermilion Bay, Coast of Louisiana. Presented to the Smithsonian Institution by J. F. Cleu, esq., May, 1866. "Petit Anse Island" is the locality of the remarkable mine of salt rock discovered during the late rebellion, and from which, for a considerable period of time, the Southern States derived a great part of their supply of this article. The salt is almost chemically pure, and apparently inexhaustive in quantity, occuring in every part of the island (which is about 5,000 acres in extent) at a depth below the surface of the soil of 15 or 20 feet.

The fragment of matting here exhibited was found near the surface of the salt and about 2 feet above it were the remains of tusks and bones of a fossil eleyhant. The peculiar interest in regard to the specimen is in its occurrence *in situ* 2 feet below the elephant remains, and about 14 feet below the surface of the soil, thus showing the existence of man on the island prior to the deposit in the soil of the fossil elephant. The material consists of the outer bark of the common southern cane (*Arundinaria macrosperma*), and has been preserved for so long a period both by its silicious character and the strongly saline condition of the soil.

The letter of transmission accompanying this specimen is from Mr. Cleu, dated New Orleans, May 10, 1866. It forms the basis of the label. He sends specimens of the rock salt, pieces of the fossil bones, and tusk of the elephant, and then says:

Below the fossil of the elephant, near the salt, we found pieces of matting made of the enamel of the canes. That work was beautiful and well preserved. It tastes salty and looks as if it had been made a few weeks ago. If I had not taken them up myself I could not believe it possible that they were found where I have stated; many more will be found but more carefully dug up. We have bought the mines and nearly the whole island, and intend to go in operation on a large scale, etc.

An inspection of this specimen caused me to suspect its antiquity. When I remarked the small and thin strips of the substance and its fragility and compared them mentally with other objects of the same reputed age, as, for example, the fossil mastodon teeth and bones which

* Prehistoric America, Marquis de Nadaillac; edited by Professor Dall, p. 36.

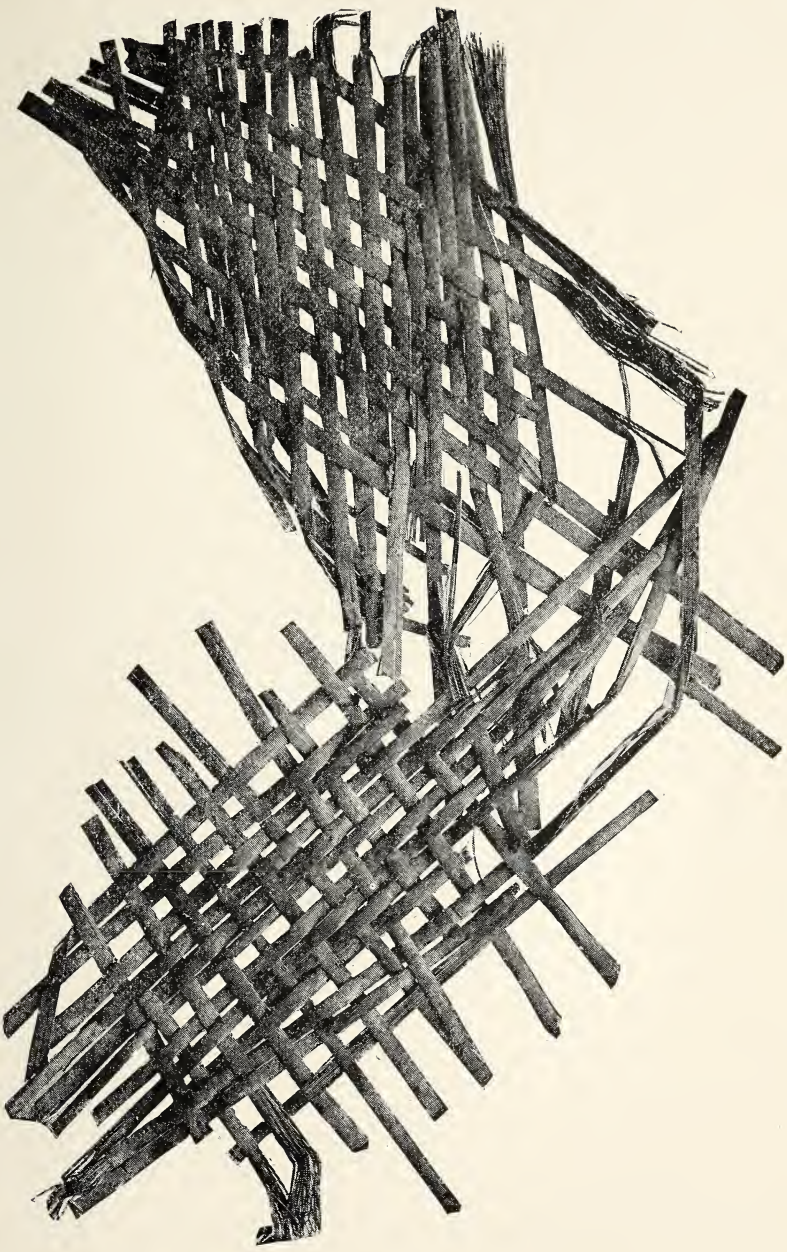
were found overlying it, and saw the effect of time upon them I became more than ever dubious of the high antiquity claimed for this matting. I submitted it to Professor Mason, who has made a special study of the basket-makers of antiquity.* He pronounced it at once to be a specimen of the common basket work of the Southern Indian, probably Cherokee. As to its actual antiquity he could give no opinion. Those Indians had made such plaited work ever since our earliest knowledge of them, and still continue it. He said one could purchase at the present day in the market at New Orleans modern Indian baskets of the same work and in every way similar.

An examination of the record of the Smithsonian Institution developed the following facts bearing upon the subject of the antiquity of this specimen:

In the summer of 1866, not long after the receipt of this specimen of matting from Mr. Cleu, Professor Henry, Secretary of the Smithsonian Institution, directed, or requested, Prof. E. H. Hilgard to undertake a geologic examination of the Louisiana salt region, the particular outcropping of which had been discovered in May, 1862, on this island of Petit Anse. Professor Hilgard availed himself of all former publications, interested numerous scientific gentlemen with him, and made an extensive geologic investigation, commencing at Vicksburg and extending down the Mississippi to its mouth, thence west up the Gulf coast to Vermilion Bay, and finishing with the five islands located therein, one of which was Petit Anse. The results of his investigations are published in the Smithsonian "Contributions to Knowledge," Vol. XXIII, and is No. 248 of the regular series. Of his conclusions as to the geologic formation of this country, or of this island, it is unnecessary to speak. He does not mention or refer in any manner to the discovery of this piece of basketry, which had been presented to the Museum only in the May previous to his detail, and which one may suppose contributed somewhat to the necessity for his investigation. The following paragraph from his report, however, bears upon the subject (page 14). He says:

> Up to the time of Dr. Goessmann's visit (in November, 1866) all the borings and pits which had reached the salt had been sunk in detrital material washed down from the surrounding hills, and frequently inclosing the vestiges of both animal and human visits to the spot. Mastodon buffalo, deer, and other bones; Indian hatchets, arrow-heads, and rush baskets, but above all an incredible quantity of pottery fragments which have been extracted from the pits. The pottery fragments form at some points veritable strata 3 to 6 inches thick; this is especially the case where Mr. Dudley M. Avery found what appeared to have been a furnace for baking the ware (a process very imperfectly performed), and near it three pots of successive sizes, inside of each other. The pots must be presumed to have subserved the purpose of salt-boiling; for although human handiwork has been found so close to the surface of the salt as to render it probable that its existence in mass was once known, yet the boiling process alone has been resorted to within even traditional times until the discovery, at the bottom of a salt well, of the solid rock-salt.

* Smithsonian Report, 1884, pp. 291–306.



ANCIENT INDIAN MATTING.

From Petit Anse Island, near Vermillion Bay, Louisiana. Presented by J. F. Cleu, 1866. (Cat. No. 1133, U. S. N. M.)

With a foot-note thus:

It is very positively stated that mastodon bones were found considerably above some of the human relics. In a detrital mass, however, this can not be considered a crucial test.

The discovery or finding of this piece of matting by Mr. Cleu in the position indicated, to wit, above the rock-salt, but beneath the fossil bones, tusks, etc., of the elephant or mastodon may be conceded. There seems to have been nothing strange or suspicious in such a discovery. But finding it in the detrital mass, as reported by Professor Hilgard, robs it of all weight as evidence of the antiquity of man. The surface or top of the solid body of rock-salt appears to have been somewhat irregular, to have conformed generally to the surface of the earth above it, to have been at a depth of about 15 feet, to have been principally under the line of high-tide water, though at one place it appeared above. The island is quite small, nearly round, with an area of 2,240 acres, and dotted over with hills, the highest being 180 feet. From this description it can be easily understood, as Professor Hilgard says, that a "detrital material was washed down from surrounding hills and frequently inclosing the vestiges of both animal and human visits to the spot." Mr. Cleu says that many more of these pieces of matting will be found, etc.

In the light of these examinations the position of this matting is explained, and we see that it has no bearing upon the question of the antiquity of man. The same claim would apply with equal propriety to the buffalo, deer, and other bones, to the Indian hatchets and arrowheads, and to the incredible quantity of pottery fragments found by Professor Hilgard. These, together with the matting and the fossil mastodon bones and tusks, have all been washed down from the surrounding hills and swept back and forth, in no one knows how many relative changes of position, by each recurring tide. The matting being found under the mastodon fossils in the detrital mass is no evidence that this was their original position or that the deposition of both may not have belonged entirely to modern times.

# RESULTS OF AN INQUIRY AS TO THE EXISTENCE OF MAN IN NORTH AMERICA DURING THE PALEOLITHIC PERIOD OF THE STONE AGE.

By Thomas Wilson.

The existence and the antiquity of the paleolithic period in Europe had been so well established by the investigations of European prehistoric anthropologists as to neither require demonstration nor admit of discussion.

The prehistoric people of North America, as they have been generally known, whether mound-builders or Indians, all belonged to the neolithic period of the stone age, unless there is to be established an age of copper.

Their cutting implements of stone were not brought to an edge by chipping as was done in the paleolithic period, nor were these implements chipped in the sense of the term as used in connection with that period. On the contrary, they were polished or made smooth by rubbing against or upon another stone. Their cutting edges were made sharp in the same way. This was a new invention, and constituted the distinctive mark between the civilization of the two periods. The peoples of the neolithic period had much the higher civilization. They made pottery, had flocks and herds, a knowledge of agriculture, a society organized into tribes or bands, buried their dead with ceremony, mourned their loss, and erected burial monuments.

They were numerous in North America, and spread over or occupied, at one time or another nearly, if not quite, the entire continent; their tribes were many, they employed different languages, made and used a variety of curious implements, and their monuments are yet a source of wonder and surprise. These things have rendered the mine of ethnologic lore in America so rich and with such great opportunities, that the attention of the anthropologist and ethnologist of our country have been fully absorbed and left with but little incentive to investigate that ruder but earlier period—the paleolithic.

My attention has been turned towards this period, and I determined to give it a share of that consideration to which I felt it was entitled. I make but small claim to original discovery; most of my facts have been heretofore known, but they were isolated, disconnected, unrecognized, and almost valueless. I have now grouped them, here and there

filled the gaps with new facts, formulated all, and hope I have established their bearing one upon another, and thus proved (to my own satisfaction, at least) the general occupation of the United States by man during the paleolithic period. Other persons have heretofore expressed their belief in this proposition, but as yet it has not been proved. The evidence which they presented may have been good, but it was insufficient.

Many years ago Signor Capellini, rector of the University of Bologna, visited the United States, and reported having found at Burlington, Iowa, a paleolithic implement of white flint.*

Professor Joseph Leidy, in 1873, reported having found paleolithic implements in flint, jasper, and quartzite at or near Fort Bridger, Wyoming.†

Professor Leidy says:

"In some places the stone implements are so numerous, and at the same time so rudely constructed, that one is constantly in doubt when to consider them as natural or accidental and when to view them as artificial. Some of the plains are so thickly strewn with natural and artificial splintered stones that they look as if they had been the battle-fields of great armies during the stone age."

But Dr. Leidy did not know these implements to be what they really were, that is, implements of the paleolithic period. His friend Dr. Van A. Carter, residing at Fort Bridger, and well acquainted with the language, history, manners, and customs of the neighboring tribes of Indians, informed him that they knew nothing about these implements. He reported that the Shoshones looked upon them as the gift of God to their ancestors.

The discovery by Dr. Abbott of paleolithic implements in the gravel drift of the Delaware River at Trenton was the leading discovery which bore testimony to the existence of man in America during the paleolithic period. His discovery was valuable, and no doubt is to be thrown upon the genuineness of the implements. They tend to prove as well the antiquity as the existence of the paleolithic period in America. By this discovery Trenton occupies much the same relation to American prehistoric anthropology that Abbeville does to European.

Less known, but believed to be equally authentic, was the discovery of paleolithic implements by Miss Franc E. Babbitt in 1879 at Little Falls, Minnesota; by Dr. Metz, in the river gravel of the Little Miami at Loveland, near Cincinnati; by Professor McGee of a possibly paleolithic spear-head of obsidian in the valley of Lake Lahontan in northwestern Nevada; by Dr. Hilborn T. Cresson, of Philadelphia, at Claymont, Delaware, and Upland, Chester County, Pennsylvania, and of a supposed paleolithic fire-place or hearth, explained by Prof. G. K. Gilbert.

Conceding for these finds of paleolithic implements full authenticity,

* Le Prehistorique, par G. de Mortillet, p. 178.

† U. S. Geological Survey, 1872 (Hayden), p. 651, figs. 1–12.

they only show an isolated and widely scattered occupation by man during the paleolithic period. They are far from showing a general occupation as has been established in southern and western Europe. If the occupation shown by these finds was truly that of the paleolithic man I could not bring myself to believe that it was restricted in this way, and I thought that his implements should be found elsewhere. This was needed to establish a general occupation, and a general occupation must be established before the scientific world would accept the fact as proved.

My residence in Europe and my acquaintance with European prehistoric anthropology, especially that portion relating to the paleolithic period, caused me to be deeply interested in the question of the existence of man during a like period in America, and I began my investigations immediately upon my return. I found in the Museum many objects labeled "Rude and Unfinished Implements of the Paleolithic Type," and I queried whether they were not truly paleolithic. I was answered in the negative, and it was said that they were but the unfinished implements of the Indians; in fact, his *failures* when making the more finished and perfect implements. And it was further said that they were always found in connection, and associated with the more perfect implement. While it was not said that they could not be found under the surface or in gravels, yet it was declared that they had not been so found; on the contrary, all had come from the surface. The argument did not satisfy me, and I pushed my investigations and comparisons. I discovered that certain of the implements displayed in the Museum under the name aforesaid, had been found by Mr. E. P. Upham, my assistant, in times past on the hills around the city of Washington, chiefly those of Piney Branch and Rock Creek. Guided by him I visited the neighborhood and our searches were crowned with such success that in the first afternoon we found a greater number than we could carry home. I have since visited the same places in company with several scientific gentlemen of the Geological Survey, Professors Gilbert, McGee, Holmes, Henshaw, and Mr. DeLancey Gill, whose knowledge and experience were of great benefit. We were aided by Mr. S. V. Proudfit and Mr. E. R. Reynolds, who have pushed their explorations on the Eastern Branch of the Potomac and in the vicinity of the Chain Bridge. These rude implements were found everywhere in profusion.

Comparison is as good a rule of evidence in archæology as in law. I applied it by comparing these unknown and unrecognized implements with those from foreign countries which were recognized and admitted as genuine implements made by man during the paleolithic period in those countries, and as representatives of its civilization. The result was not less surprising than gratifying. My examination proved to me that, though coming from lands however distant, from other continents separated from ours by wide oceans, these were all the same implements. Their identity was complete. Both showed the handiwork of

man, and were undeniably manufactured for the same purpose and representing the same civilization or culture. An examination and comparison of the implements themselves are necessary in order to understand the full force of these statements.

The remarks of Dr. Leidy as to the great number of these implements which he found in the Bridger basin apply with equal force to the bluffs and hills around the city of Washington. The reports of these implements in the Museum, from the District of Columbia, are as follows:

| | |
|---|---|
| Mr. Shoemaker | 22 |
| Mr. Reynolds | 221 |
| Mr. Proudfit | 50 |
| Mr. Wilson | 299 |
| Mr. Upham | 34 |
| Mr. Webster | 119 |
| Making a total from the District of Columbia of | 745 |

Extending these investigations over the United States, Professor Langley, the Secretary of the Smithsonian Institution, at the instance of this Department, issued in January, 1888, Circular No. 36, already mentioned, and of which the following is a copy:

CIRCULAR CONCERNING THE DEPARTMENT OF ANTIQUITIES.

The Smithsonian Institution desires answers to the following questions concerning that class of American aboriginal stone relics which have been heretofore denominated "rude or unfinished implements of the paleolithic type."

Cuts of some, together with their localities, are herewith given.

Question 1. How many of these rude stone implements have you in your collection?

Question 2. Do you know of any in other museums or collections?

Question 3. Of what material are they made?

Question 4. Where have they been found?

(1) As to locality.

(2) Position, condition, and associated with what objects.

(3) Whether on or under the surface, and if so, at what depth, and in what kind of geologic formation.

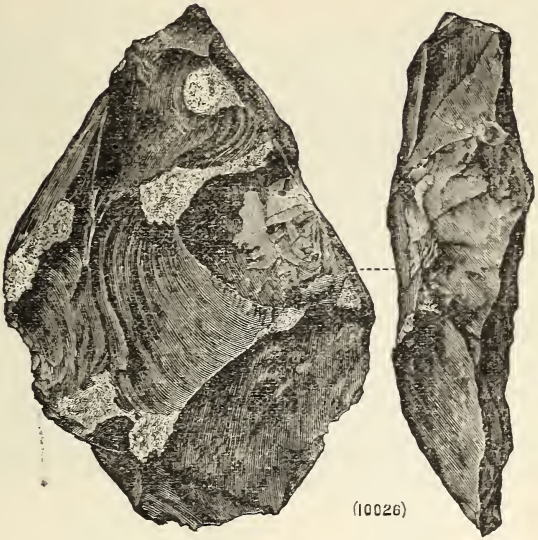
(4) Were they found in mounds, tombs, or other ancient structures.

(5) Were any other ancient implements found with them, and if so, of what kind.

(6) Did their deposit seem to be accidental or intentional.

(7) Have they been described in any publication, and if so, in what, and where can it be obtained.

(8) Can you forward specimens (as many as possible) to this Museum in exchange for publications or duplicate specimens.

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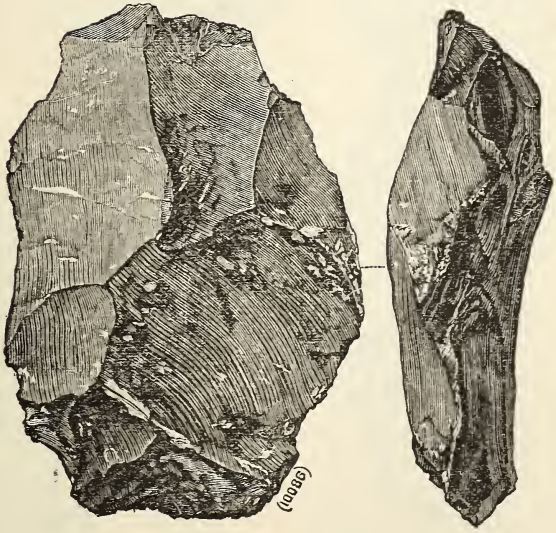
UTAH. DR. F. V. HAYDEN.

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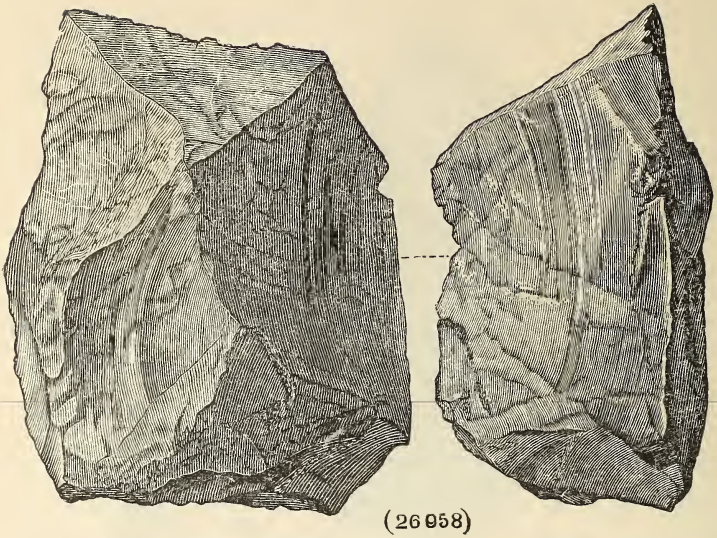
UTAH. DR. F. V. HAYDEN.

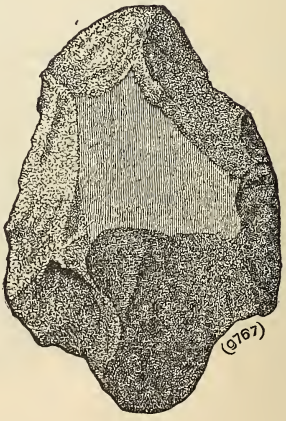



½

NEW JERSEY. DR. C. C. ABBOTT.

½

MARYLAND. O. N. BRYAN.

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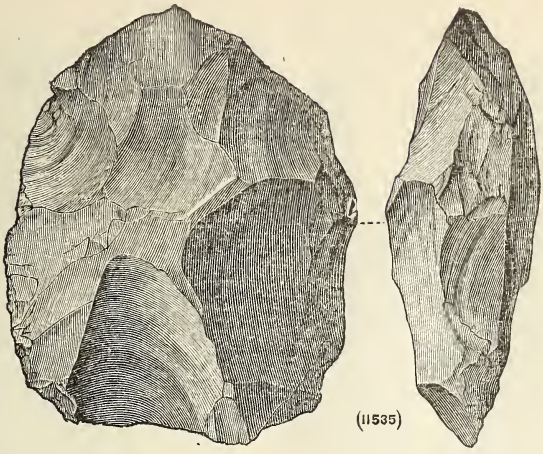
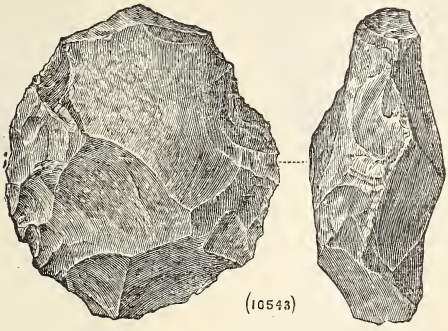
MARYLAND. O. N. BRYAN.




WYOMING TERRITORY. ½ DR. JOS. LEIDY.

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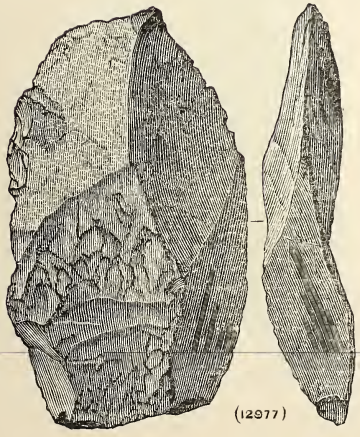
WYOMING TERRITORY. DR. F. V. HAYDEN.

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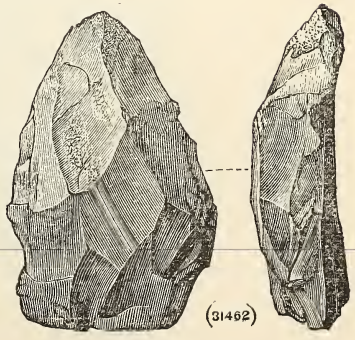
OREGON. PAUL SCHUMACHER.

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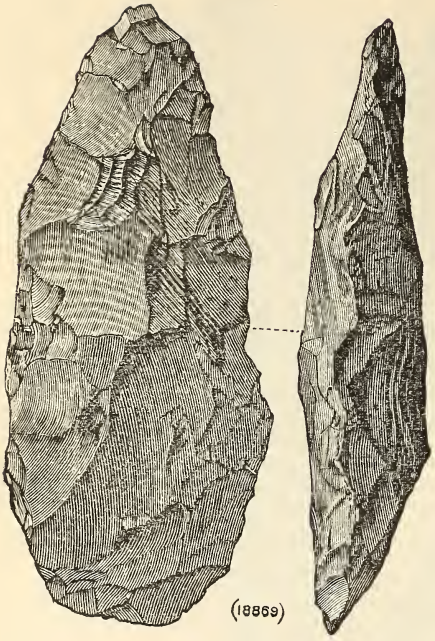
KENTUCKY. F. BRAUN.

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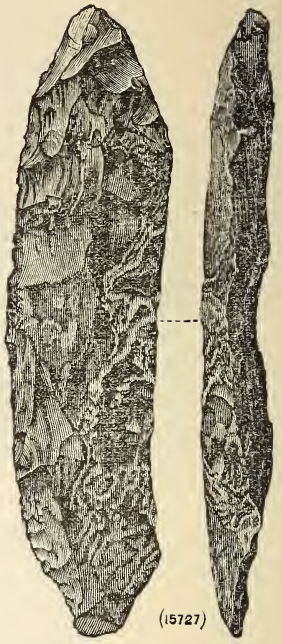
TEXAS. J. VAN OSTRAND.

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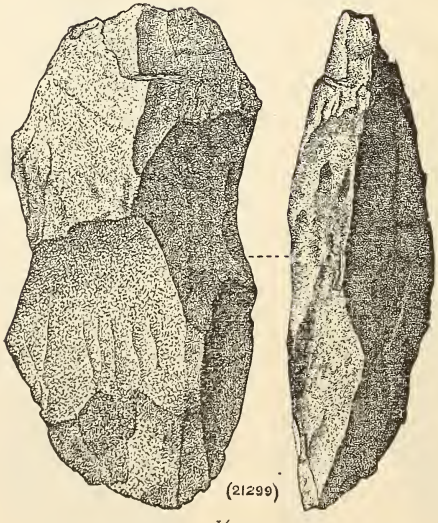
CALIFORNIA. W. G. HARFORD.

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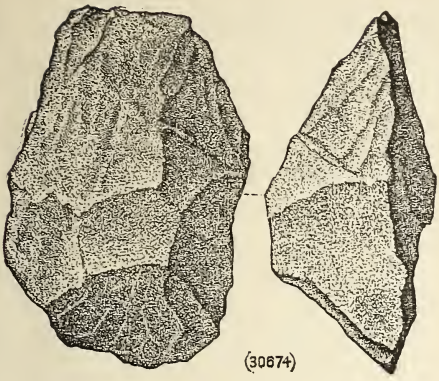
NORTH CAROLINA. HOWARD HAYWARD.

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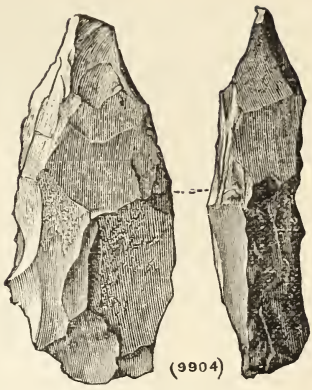
PENNSYLVANIA. A. F. BERLIN.

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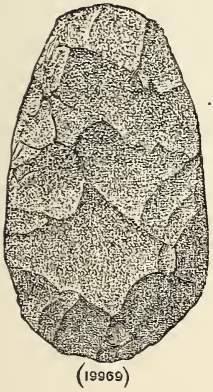
TENNESSEE. J. PARISH STELLE.

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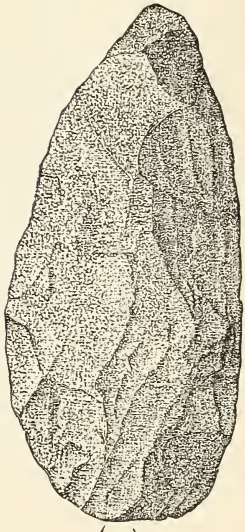
TENNESSEE. W. M. CLARKE.

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DISTRICT OF COLUMBIA. JAMES WEBSTER.

The Museum received two hundred and nine responses. The number of implements reported by the correspondents from twenty-three States and Territories is six thousand seven hundred and sixty-two, but twenty-eight persons report an indefinite number in their collections which is incapable of addition: "A few," "some," "many," "plenty," "hundreds," "a large number," etc. These have not been counted into this aggregate. Thirty-three persons sent one thousand one hundred and eighty-nine of the "rude implements" for which they all received an equivalent in exchange. The objects actually received from those thirty-three persons were nearly double the number mentioned. Those

which from their form, appearance, material, mode of fabrication, were decided not to be paleolithic, have been eliminated.

A tabulated statement showing the results accomplished by the distribution of this circular is here given:

| Name of State. | Answers received. | Implements reported. | Number sent. | Original number in Museum. | Total. |
|---|---|---|---|---|---|
| Maine | 9 | 196 | 19 | 3 | 218 |
| Vermont | 6 | 70 | 27 | ..... | 97 |
| Massachusetts | 14 | 79 | 17 | 96 | 393 |
| Connecticut | 3 | 8 | ..... | 19 | 27 |
| New York | 20 | 530 | 95 | 7 | 632 |
| New Jersey | 3 | 348 | 2 | 41 | 591 |
| Pennsylvania | 20 | 1,000 | 180 | 39 | 1,219 |
| Maryland | 4 | 33 | ..... | 59 | 92 |
| District of Columbia | 8 | 869 | 239 | 298 | 1,406 |
| Virginia | 3 | 400 | 26 | 13 | 439 |
| North Carolina | 2 | 13 | 23 | 5 | 41 |
| South Carolina | 3 | ..... | ..... | ..... | ..... |
| Georgia | ..... | ..... | ..... | 10 | 10 |
| Florida | 1 | 20 | ..... | 31 | 51 |
| Alabama | 3 | 1 | 8 | 25 | 34 |
| Texas | 1 | ..... | ..... | 6 | 6 |
| Ohio | 29 | 1,215 | 71 | 66 | 1,352 |
| Indiana | 13 | 489 | 26 | 26 | 541 |
| Illinois | 17 | 189 | ..... | 23 | 212 |
| Kentucky | 2 | 25 | ..... | 15 | 40 |
| Tennessee | 5 | 48 | 30 | 18 | 96 |
| Michigan | 9 | 224 | 6 | ..... | 230 |
| Wisconsin | 6 | 21 | ..... | 6 | 27 |
| Iowa | 3 | Few ..... | 10 | 2 | 12 |
| Missouri | 7 | 335 | 10 | 5 | 350 |
| Arkansas | 2 | 86 | ..... | 4 | 90 |
| California | 5 | 57 | ..... | 38 | 95 |
| Minnesota | 2 | ..... | ..... | 48 | 48 |
| Oregon | ..... | ..... | ..... | 7 | 7 |
| Kansas | 5 | ..... | ..... | ..... | ..... |
| Nebraska | 1 | ..... | ..... | 3 | 3 |
| Colorado | ..... | ..... | ..... | 8 | 8 |
| Utah | 1 | ..... | ..... | 25 | 25 |
| Wyoming | ..... | ..... | ..... | 4 | 4 |
| Arizona | 1 | ..... | ..... | ..... | ..... |
| Canada | 1 | 106 | ..... | ..... | 106 |
| | 209 | 6,762 | 789 | 950 | 8,502 |

RECAPITULATION.

| | | |
|---|---|---|
| Number of implements reported | | 6,762 |
| Number sent to Museum | 789 | |
| Number already in Museum | 950 | |
| | | 1,739 |
| | | 8,501 |

In the science of prehistoric anthropology almost the sole means of study are the implements and monuments made and used by prehistoric man. To render this study available it becomes of prime importance that we should know not only the locality of the implement or object studied, but also its position, condition, and relation to other objects with which it may be found associated. It is coming to be recognized as the duty of every discoverer, if he would make his find of any value, to note carefully its condition, position, and association with other objects. His failure to do this destroys its principal value.

I have endeavored during the past year to secure such a description of all specimens received. The official catalogues of the Museum are furnished to us with their numbers completed, one line only to each number, and this is subdivided so as to give name, date, locality, donor, etc., which, with the official number, fills the line. It is manifestly impossible to give in this catalogue the description needed to make the specimen appreciated or valued. It is almost, if not quite, as impracticable to give the specimen its proper value if all the information concerning its discovery is allowed to lie in the registrar's files and to be found only there. Therefore I have briefed all letters giving such information concerning the specimens received, putting it in the most concise form possible, which I transmit with this report, to the end that they may be printed with it and so be made accessible to the student, to the public, and to the office.

The following are briefs of these letters. The type Solutreen mentioned refers to leaf-shaped implements, which would in Europe be classed as paleolithic. Whether they are to be so classed in America awaits future investigation. The other paleolithic implements, usually unmentioned in the brief, refer to Chellian implements which are not considered doubtful:

C. M. Sawyer, Mechanics' Falls, Maine, April 2, 1888. Sends sixteen specimens, seven of which are paleolithic (type Solutreen). Material, jasper. Found on the surface of the shores of Sebago Lake and at Raymond, Cumberland County, Maine. Accession 20446; catalogue Nos. 137593–137606.

Prof. G. H. Perkins, University of Vermont, Burlington, Vermont, February 15, 1888. Has many rude implements. Material, bluish-gray quartzite, argillite, hornstone, and some of granite. Found on the surface near streams. Deposit accidental. Sends forty-six specimens, eighteen of which are paleolithic, Accession 20554; catalogue No. 139429.

Prof. G. H. Perkins, University of Vermont, Burlington, Vermont, June 12, 1888. Sends eighteen specimens from Bristol Pond, Monkton, Vermont, four of which are paleolithic. Surface finds. Accession 20734; catalogue Nos. 139659–139665. Has very few larger than the largest of this lot.

Prof. G. H. Perkins, University of Vermont, Burlington, Vermont, July 16, 1888. Sends fifty rude implements, five of which are paleolithic. Found on the surface in the Mississco Valley, northern Vermont, *i. e.*, Swanton and Highgate. Accession 20878; catalogue Nos. 139724–139730.

Peabody Academy of Science, Salem, Massachusetts, February 6, 1888. J. Robinson, treasurer, in charge of Museum. Has a large number of rude implements from 1 to 6 inches in length. Sends seven specimens (paleolithic) from Essex County,

Massachusetts. Material, porphyritic felsite. Found down to 18 inches below the surface. Accession 20159; catalogue Nos. 137610–13761f.

Willard Nye, jr., New Bedford, Massachusetts, May 9, 1888. Sends ten specimens; disks of quartz, porphyry, etc. Found on the surface at the west end of Martha's Vineyard Island, Massachusetts, associated with arrow and spear heads, drills, scrapers, and fragments of pottery. Accession 20579; catalogue No. 139439. These probably belong to the shell-heaps, and may not be paleolithic.

Merritt Willis, West Farms, New York City, February 12, 1888. Sends two rude implements (paleolithic) from Trenton, New Jersey, and one from West Chester, New York. Accession 20331; catalogue Nos. 139194–139195.

Dr. A. L. Benedict, Buffalo, New York, March 16, 1888. Sends thirty flint implements (type Solutreen) from Buffalo, New York, and five rude implements (type Solutreen) from Fort Erie, Canada. They were found on the sites of Indian villages associated with other stone implements. Deposit accidental. These rude implements are found in great number all around the falls on both sides. Accession 20365; catalogue Nos. 139291–139292.

F. Roulet, Newark Valley, New York, June 4, 1888. Sends sixteen specimens, fourteen of which are paleolithic (type Solutreen). Material slate, limestone, etc. All found in Pennsylvania, mostly along the banks of the Susquehanna River. Accession 20688; catalogue Nos. 139618–139620.

A. G. Richmond, Canajoharie, New York, June 17, 1888. Sends collection of three hundred and ninety-five specimens, embracing hammerstones, scrapers, and arrow-points (flint and chert), notched sinkers, fragments of pottery, shell, bones, etc., from old Indian village sites in the Mohawk Valley, Montgomery County, New York. Only four of these specimens can be classed as paleolithic. Accession 20784; catalogue Nos. 139667–139720.

Dr. B. D. Skinner, Greenport, New York, February 20, 1888. Sends twenty rude implements (paleolithic) of quartz; found upon the surface over glacial drift in the vicinity of Greenport, Long Island, New York. Accession 20238; catalogue Nos. 139037–139041. These probably belong to shell heaps, and may or may not be paleolithic.

W. W. Adams, Mapleton, New York, February 27, 1888. Sends five specimens (type Solutreen). Material, chert; found on the surface in the vicinity of Mapleton. Accidental deposit. Has no more. Accession 20248; catalogue No. 139150.

W. W. Tooker, Sag Harbor, New York, March 9, 1888. Has one hundred rude implements, majority of quartz, others of slate, argillite, etc.; found on the surface, in shell-heaps, on village sites, and in deposits from 3 to 5 feet in depth. Sends sixteen rude implements (paleolithic), principally of quartz; from the surface and from shell-heaps, in the vicinity of Sag Harbor, New York. Has never found them (rude implements) as described by Dr. Abbott. Has found them at the talus of the bluffs. Rude axes have been found in digging wells at great depths.

Accession 20418; catalogue Nos. 139340–139355. These probably belong to shell-heaps, and may or may not be paleolithic.

Howard B. Davis, Reading, Pennsylvania, February 18, 1888. Sends twenty-two specimens, six of which are paleolithic; found along the Schuylkill River about one mile south of Reading in freshly ploughed fields. Deposit accidental. Accession 20210; catalogue Nos. 139031–139036.

J. M. M. Gernerd, Muncy, Pennsylvania, February 13, 1888. Sends one hundred and fifty specimens and has one hundred and fifty left. These implements (type Solutreen) are from Muncy Valley, along west bank of Susquehanna River. Surface finds. None ever found in mounds. Accession 20191; catalogue No. 139026.

A. Sharpless, West Chester, Pennsylvania, February 6, 1888. Sends three specimens, two of which are paleolithic; found on the surface with chips of quartz on what was evidently an old camping ground near West Chester, Pennsylvania. Accession 20158, catalogue Nos. 137608–137609. Speaks of several nests (*caches*) found in his neighborhood on the Brandywine.

A. Sharpless, West Chester, Pennsylvania, March 30, 1888. Sends a leaf-shaped cutting implement from West Chester, Pa. Not palcolithic. Accession 20429; catalogue No. 139325.

A. Sharpless, West Chester, Pennsylvania, May 8, 1888. Sends thirty-two specimens, ten of which are paleolithic, all found on the surface at West Chester, Pennsylvania. Accession 20603; catalogue Nos. 139444–139447.

D. T. Millspaugh, M. D., Kendall, Pennsylvania, June 22, 1888. Sends a leaf-shaped implement and broken arrow-head from Pennsylvania, and one leaf-shaped implement from New York (not paleolithic). Accession 20907; catalogue Nos. 139738–139740.

D. T. Millspaugh, M. D., Kendall, Pennsylvania, May 16, 1888. Has two rude implements of impure silica found about 3 inches from surface on the bank of Tunnugwant Creek, 1 mile from Bradford, McKean County, Pennsylvania, associated with chippings, the latter, however, not in great enough number to be considered a manufactory. Deposit accidental. He says the locality is rich in mounds and the evidences of Indians.

E. R. Reynolds, Washington, District of Columbia, April 17, 1888. Has hundreds. Sends two hundred and fifty-nine specimens, two hundred and seventeen of which are paleolithic. Material quartz, quartzite, argillite, etc. All surface finds from different localities in the District of Columbia. Accession 20497; catalogue Nos. 139401–139412.

S. V. Proudfit, Washington, District of Columbia, March 17, 1888. Sends one hundred and thirty arrow-heads and one unstemmed spear-head from the District of Columbia. Not paleolithic. Accession 20358; catalogue Nos. 139244–139289.

Ernest Shoemaker, Washington, District of Columbia, February 12, 1888. Has about one hundred rude implements, all from the District of Columbia and neighboring country. Sends thirty-five specimens, twenty-two of which are paleolithic. Material principally of quartzite. Found on the surface. Accession 20175; catalogue Nos. 139007–139010.

Howard Shriver, Wytheville, Virginia, February 13, 1888. Sends two white quartz arrow-heads. Not paleolithic. Accession 20182; catalogue No. 139022.

Nathaniel S. Way, Accotink, Virginia, February 13, 1888. Has about four hundred of quartz and quartzite, found near Accotink on the surface. The implements are small near the river and larger inland. Sends twenty-two specimens, twenty of which are paleolithic. Accession 20185; catalogue Nos. 139028–139029.

Nathaniel S. Way, Accotink, Virginia, April 24, 1888. Sends six rude implements (paleolithic) of quartzite; found on the surface near Accotink, Fairfax County, Virginia. Accession 20507; catalogue No. 139413.

Howard Haywood, Raleigh, North Carolina, March 19, 1888. Has sixty specimens. Sends thirty rude implements, eight of which are paleolithic. All were found on the surface in the vicinity of Raleigh, on Crab Tree Creek, about 50 yards from the shore and about 12 feet above its level, associated with arrow-heads, broken pottery, and chips of flint. Light sandy soil with red clay subsoil. The deposit seemed to be accidental. Accession 20357; catalogue Nos. 139214–139243.

J. A. D. Stephenson, Statesville, North Carolina, February 6, 1888. Has quite a number, principally of quartzite containing some impurities which weathers slightly when long exposed. Found on the surface in Iredell, Alexander, and Catawba Counties, North Carolina. Sends three specimens of rude implements (type Solutreen). Material quartzite; found in *deposits* in Iredell and Alexander Counties, North Carolina. Many deposits of these implements found in this neighborhood; they are generally buried deeper in valleys and slighter on the mountains. No other implements found with them. Deposit intentional. None found in mounds. Accession 20183; catalogue Nos. 139023–139025.

J. A. D. Stephenson, Statesville, North Carolina, March 3, 1888. Sends thirty-four specimens, twelve of which are paleolithic. Material principally of quartzite—found

on the surface near Statesville, North Carolina. Accession 20479; catalogue Nos. 139356–139361.

J. R. Nissley, Ada, Ohio, March 14, 1888. Sends twelve specimens, five of which are possibly paleolithic (type Solutreen). Found on the surface at Red River Spring Creek and Elk Fork, Todd County, Kentucky, and Montgomery County, Tennessee. Accession 20345; catalogue Nos. 139200–139203.

J. Freshwater, Loudonville, Ohio, February 1, 1888. Sent one leaf shaped cutting implement. Not paleolithic. Found on the surface at Loudonville. Lives in a river valley where there is from 150 to 200 feet of drift; never found any worked implements in the gravel or drift. Accession 20189; catalogue No. 139027.

D. T. D. Dyche, Lebanon, Ohio, February 8, 1888. Sends forty-five specimens; all from Warren County, Ohio. Found on the surface, thirteen of which are paleolithic. Accession 20174; catalogue Nos. 138999–139006.

J. A. Stevenson, Akron, Ohio, March 16, 1888. Sends collections of three hundred and eighty-five specimens. Four rude implements (paleolithic) from Summit County, Ohio, and fourteen rude implements (paleolithic) from Juniata County, Pennsylvania. Accession 20371; catalogue Nos. 139293–139324.

Warren K. Moorehead, Xenia, Ohio, February 7, 1888. Has thirty rude implements of flint. Sends ten (paleolithic) implements from the undisturbed gravel, Little Miami River, Fort Ancient, Warren County, Ohio, and ten (paleolithic) from the gravel on the bed of "Old Town Run," 3 miles north of Xenia, Greene County, Ohio. Found 2 or 3 feet from surface, associated with flint flakes. Deposit accidental. Not found in mounds or tombs. Accession 20330; catalogue Nos. 139198–139199.

James C. Wright, Fredonia, Ohio, February 27, 1888. Sends fifty specimens, six of which are paleolithic (type Solutreen). Material flint or burr-stone. Found upon the surface in Licking County, associated with arrow and spear points. A few of the leaf-shaped implements have been found in mounds. Accession 20550; catalogue Nos. 139431–139438.

C. T. Wiltheiss, Piqua, Ohio, March 6, 1888. Sends fifty-seven specimens, principally of flint, seventeen of which are paleolithic (type Solutreen). These implements wash out of the east bank of the Miami River on the bottom lands, from a stratum of yellow clay covered by a layer of black loam 3 or 4 feet in thickness. Accession 20311; catalogue Nos. 139181–139193.

Carey Bell, Utica, Ohio, March 22, 1888. Has quite a number of rude implements, principally of chert or flint. Mostly surface finds, associated with finer (better finished) specimens. Sends twenty-five specimens, six of which are paleolithic. Accession 20413; catalogue Nos. 139326–139332.

H. W. Hanna, Warsaw, Indiana, February 9, 1888. Has several rude implements. Sends one specimen (paleolithic) of flint. Found on the surface in Wabash County, Indiana. Accession 20180; catalogue No. 139020.

W. H. Hanna, Warsaw, Indiana, May 28, 1888. Sends a small rude implement, a scraper, and three arrow-points. Found near the surface upon the bluffs above the bottom lands of the Wabash River, near Warsaw. Not paleolithic. Accession 20717; catalogue Nos. 139656–139658.

G. K. Green, New Albany, Indiana, March 17, 1888. Sends fourteen specimens (paleolithic), from ancient burying-ground at Clarksville, near mouth of Silver Creek, which empties into the Ohio about 1 mile east of New Albany, and is a dividing line between Clark and Floyd Counties, Indiana. Accession 20362; catalogue No. 139290.

G. K. Green, New Albany, Indiana, May 18, 1888. Sends eight rude implements (paleolithic). Accession 20633; catalogue Nos. 139494–139501.

Dr. E. C. Black, Wheatland, Indiana, February 10, 1888. Has fifteen rude implements, found in a *cache* in the eastern part of Knox County, Indiana. Sends one specimen (type Solutreen). Accession 20178; catalogue No. 139018.

W. H. Adams, Elmore, Illinois, February 8, 1888. Sends sixty implements—flakes,

scrapers, cutting implements, etc., from Kitchen Mounds, in Peoria and Knox Counties, Illinois; also a map or chart of these mounds. Nothing paleolithic. Accession 20177; catalogue Nos. 139011–139017.

W. H. Adams, Elmore, Illinois, April 1, 1888. Sends two rude implements (paleolithic) of flint—surface finds from Peoria County, Illinois. Accession 20481; catalogue No. 139339.

James C. Null, McKenzie, Tennessee, April 30, 1888. Has twenty-five rude implements of flint—surface finds. Sends a collection of two hundred and seventy-one specimens from Carroll County, Tennessee, thirty of which are paleolithic. Accession 20545; catalogue Nos. 139414–139428.

C. L. Stratton, Chattanooga, Tennessee, February 17, 1888. Sends box of stone implements from northern Georgia and Alabama (four hundred and sixteen specimens); nothing paleolithic. Accession 20240; catalogue Nos. 139042–139055.

C. A. Thompson, Quincy, Michigan, February 22, 1888. Has a few made of sandstone, slate, and chert; found along the streams and in sandy ground. None have ever been found in mounds. Deposit seemed accidental. Sends eighteen specimens, three of which are paleolithic (type Solutreen). Accession 20353; catalogue Nos. 139205–139213.

Charles Ruggles, Bronson, Michigan, February 15, 1888. Sends three rude implements (paleolithic), also drawings of others in his collection. All found on the surface along the banks of two small brooks in Bronson, Michigan. Accession 20208; catalogue No. 139030.

William H. Sheldon, Climax, Michigan, April 2, 1888. Has forty-eight rude implements. Forty-seven are of flint, one of ironstone. Three were found on the surface. Forty-four were in a nest or *cache*. Not associated with any other objects. Deposit of the forty-four specimens intentional. Sends ten rude arrow and spear heads, etc. Surface finds from Kalamazoo County, Michigan. Nothing paleolithic. Accession 20807; catalogue Nos 139624–139631.

J. E. Gere, Riceville, Wisconsin, May 21, 1888. Sends eighty stone implements—flakes, scrapers, arrow and spear heads, etc., and ten pieces of native copper. All from Wisconsin. Nothing paleolithic Accession 20653; catalogue Nos. 139511–139520.

Horace Beach, Prairie du Chien, Wisconsin, February 6, 1888. Has twenty specimens of flint, some found in mounds and others on the surface. Sends fifteen specimens, none of Chellian type, three Solutreen. Accession 20171; catalogue Nos. 138985–138998.

Dr. F. A. Steinmeyer, Bonaparte, Iowa, May 22, 1888. Sends five paleolithic implements, one large and four small, found in the vicinity of Bonaparte, at a depth ranging from 2 to 5 feet under the soil, which is clay. They were found in their original positions and the deposit appeared to be accidental. Accession 20684; catalogue Nos. 139622, 139623.

Davenport Academy of Natural Science, Davenport, Iowa. W. H. Pratt, curator, June 19, 1888. Sends fifty-two specimens from Iowa and other States and Territories. Five rude implements (paleolithic) from Louisa County, Iowa, and eight small rude implements (paleolithic) from Alabama. The implements from Louisa County are from what is locally designated "the Old Fort Grounds," now and for many years in a corn-field. Forty years ago it was surrounded by an earth-wall averaging 4 feet in height. (See Proc. Davenport Acad. Nat. Sci., vol. I, p. 109.) Accession 20751; catalogue Nos. 139632–139655.

Marion Crawford, Kahoka, Missouri, February 27, 1888. Sends twenty-seven specimens from Clark and Lewis Counties, Missouri, ten of which are paleolithic. Found on the surface. Accession 20252; catalogue Nos. 139153–139179.

Charles Teubner, Lexington, Missouri, March 3, 1888. Has two hundred rude implements of chert, found on the surface in Boone, Montgomery, Warren, Gasconade, Osage, Cole, and La Fayette Counties, Missouri, principally La Fayette. Sends eleven card photographs representing flint arrow-heads, etc., from Gasconade and other

counties in central Missouri. Nothing paleolithic. Accession 20329; catalogue Nos. 139196–139197.

Dr. W. S. Newlon, Oswego, Kansas, February 8, 1888. Sends flint chips and fragments of leaf-shaped implements, found on the surface near Oswego. Not paleolithic. Accession 20181; catalogue No. 139021.

Dr. W. S. Newlon, Oswego, Kansas, March 16, 1888. Sends two flint cores, sixteen fragments of chipped implements, and one box of chips and flakes found on the surface near Oswego. Not paleolithic. Accession 20460; catalogue Nos. 139376–139378.

Dr. W. S. Newlon, Oswego, Kansas, May 7, 1888. Sends collection of flakes, arrowheads, shells, etc., from the site of an old Indian village at Oswego. Nothing paleolithic. Accession 20581; catalogue Nos. 139440–139443.

Dr. Henry W. Coe, Mandan, Dakota, February 27, 1888. Sends one rude cutting implement from a mound near Mandan, Dakota. Not paleolithic. Accession 20253; catalogue No. 139180.

ABSTRACT OF LETTERS RECEIVED IN ANSWER TO CIRCULAR 36.

Albert I. Phelps, Damariscotta, Maine, February 14, 1888. Has fifteen rude implements. Material, feldspar and porphyry. Found at Revere, Massachusetts, (surface) Penaquid Pond Damariscotta, Maine, and from shell-heap at Friendship, Maine. The implements from Revere were associated with arrow-points, those from Penaquid Pond with rude arrow-points, scrapers, and fragments of pottery, those from the shell heaps with flakes, arrow-points, bone implements, and fragments of pottery.

George A. Boardman, Calais, Maine, February 9, 1888. Has no rude implements.

James E. Knowlton, Damariscotta, Maine, May 5, 1888. Has one hundred and forty-four rude implements of porphyry, jasper, quartz, etc.; found in Lincoln and Knox Counties, on the coast between Kennebec and George Rivers, and on borders of lakes and rivers further inland, also in and beneath shell-heaps and associated with the usual fragments and implements. Sends seventeen specimens from Lincoln County, Maine. These belong to the shell-heaps, and may not be paleolithic. Accession 20612; catalogue Nos. 139448–139461.

"The shell-heaps in this region may be divided into two classes—the recent and ancient. The recent shell-heaps contain objects of European make associated with the implements of the stone age, and the rude pottery in these heaps has pounded shells mixed in with the clay. Shell-heaps of this class where undisturbed are arranged in small mounds resembling cradle knolls and are not over three feet deep. The shell-heaps of the older period vary in depth from three inches to thirty feet. The pottery contained in them has gravel, pounded rock, or mica, mixed in with the clay; it breaks with a shelly fracture, and was made inside a closely woven basket, while that in the recent heap breaks with a spiral fracture indicating that the coil-method was employed in manufacturing it, although most of it, like that from the older heaps, plainly shows the basket marks. With one exception objects of European make have never been found in the heaps of this class. Around and beneath the shallow heaps is a black stratum formed of ashes and decomposed animal and vegetable matter, while the deeper heaps are irregularly stratified from top to bottom. Animal bones, pottery, amd implements are more frequently found in these strata than in the shells. The decaying of the branches used by the savages as bedding, the rubbish accumulating around a savage habitation, and finally the decaying of the habitations themselves have, I believe, contributed largely to the formation of these strata in and about the shell-heaps."

A. T. Gamage, Damariscotta, Maine, February 28, 1888. Sent five rude implements. Material, black hornstone and quartz. Found in shell-heaps at McFarland's Cove, on John's Bay in the town of Bristol, on the coast 1 to 6 feet deep, with other stone implements and pottery. Deposit accidental. Also one water-worn implement found on the beach near shell-heap. He has explored the shell-heaps of the county, and

found more of these kind of implements than perfect ones. He has never found any stone tools in or near the shell-heaps that he thought were deposited or buried with human remains, but Mr. Phelps and himself took from a deposit, which was found four miles from the salt water, about one hundred and fifty stone tools of different kinds, all perfect and some very nicely finished. They were mostly celts and spear-heads. Of the five rude implements which he sent four are paleolithic. Accession 20251; catalogue Nos. 139151, 139152.

Aug. C. Hamlin, Bangor, Maine, February 18, 1888. Has no rude implements and knows of none. Thinks he has seen a few similar, but believes them to have been of recent date.

J. L. M. Willis, Eliot, Maine, February 16, 1888. Has five rude implements. One from New Jersey, two from North Carolina, and two from Newbury, Massachusetts. (One of argillite, two of quartz, two of fine granite.)

Joseph Wood, Bar Harbor, Maine, February 7, 1888. Has four rude implements. Gives drawings in outline. No. 1 from Stoneham, Massachusetts; Nos. 2, 3, and 4 from Bar Island, Bar Harbor, Maine.

E. M. Goodwin, Hartland, Vermont, March 1, 1888. Has six or more. Sends outline drawings. Nos. 1 and 3 are flint found on the surface at Fairfield, Indiana. No. 2 is a dark flint found on the surface in Tennessee. No. 4 is of brown flint found on the surface near a mound in Illinois. No. 5 is white quartzite found on the surface near a system of earth-works in Missouri. Other relics were found in close proximity. No. 6 is a fragment of a polished implement of porphyritic stone found in a mound in Fairfield, Indiana, associated with arrow and spear-points, and stone ornaments.

John M. Currier, Newport, Vermont, February 8, 1888. He has gathered these implements in Castleton, Monkton, New Haven, and Lincoln, in Vermont. Nearly all have been donated to the University of Vermont, Vermont Historical Society, and to the Smithsonian Institution. Material, Hudson River limestone, quartzite, and jasper. Those of gray quartzite are the most common, next the Hudson River limestone, and black marble. They are found on the surface. Has found some from one-half to six inches in diameter.

Prof. Henry W. Haynes, 239 Beacon street, Boston, Massachusetts, February 15, 1888. Has a collection of paleolithic implements; 23 from Trenton, New Jersey (five his own find), Dr. Abbott; 2 from Allentown, Pennsylvania (A. F. Berlin), quartzite; 1 from Millbank, Tennessee (A. F. Berlin); 16 from Little Falls, Minnesota (Miss Babbitt), quartz; 10 from eastern Massachusetts (his own find), white quartz; 10 from northern New Hampshire (his own find), white quartz; 1 from Bar Harbor, Maine (his own find), white quartz; 1 from Perkins County, Georgia (his own find), white quartz; 30 from Wakefield, Massachusetts (his own find), brown felsite; 20 from eastern Massachusetts (his own find), brown felsite; 25 from Moosehead Lake, Maine (his own find) green felsite, speckled with white quartz; 4 from Plattsburgh, New York (Dr. D. S. Kellogg); 7 from Washington, District of Columbia (his own find), yellow, quartzite; 1 from Saguenay, Lower Canada; 1 from Castine, Maine (N. S. True), fine grain argillite; 10 from Burlington, Vermont (own find), pink quartzite; atotal of 162.

The green felsite speckled with white quartz, from Moosehead Lake (twenty-five specimens), is the same material of which most of the Indian implements are made, which he found in the shell-heaps in the southeastern part of Maine, at Frenchman's Bay and elsewhere. Has described his white quartz implements in Proc. Boston Soc. Nat. Hist., February 1, 1882, vol. XXI, p. 382. Many of these were found in "hard pan" or glacial till, 3 or 4 feet below the surface, and where no Indian implement could be found. But has found some associated with Indian implements. Their deposit seems to have been always accidental.

Professor Haynes, of Boston, read a paper, February 1, 1882, before the Boston Society of Natural History, vol. XXI, page 382, in which he reports the finding of similar implements in various localities in New

Hampshire, Vermont, and Massachusetts. He enlarges (and very properly to) upon his extended experience with the paleolithic implements of the world. He expresses, without hesitation or doubt, that these implements were the intentional work of man; that they were not made by, nor did they belong to the Indian of that country. He says, page 385:

But no such traces of Indian occupation has the most painstaking investigation revealed to me in many places where I have found the new types of rude implements in considerable quantities.

Again, page 388:

It will be noticed that all of these rude and simple tools have been fabricated out of the hardest, heaviest, toughest kinds of rocks that the region where they are found can furnish. They are commonly made of white or milky quartz, or quartzite, felsite, or of some very compact variety of syenite or granite. Often they have been fashioned out of a pebble from the glacial drift, which still retains a portion of its original surface or crust. This circumstance proves that they must necessarily be post-glacial in date, whether they have been found deeply bedded in the earth or upon the surface of ploughed fields.

Professor Haynes sums up his argument:

I infer the former existence in New England of a race of men different from and less advanced than the Indians, because I have found in many localities, where none of the ordinary traces of Indian occupation could be discovered, a large quantity of stone implements of ruder types and coarser make than those habitually used by them. Whether these are actual relics of primeval man, *i. e.*, of a race who lived long anterior to the Indians, or whether they are the work of the degraded descendants of an earlier people who had succumbed to the Indians, I do not undertake to pronounce.

The difference between Professor Haynes and myself is that he is unwilling to attribute these implements to a paleolithic period. He insists that to be evidence of this the implements in question should be found in the river gravels, or in a corresponding geologic stratum. I know that in many countries where the existence of a paleolithic period is undoubted, the implements (principally Chellian or of the earliest epoch) have been found on the surface, and they are identified as such, by comparison with others found in the river gravels. My experience with these implements in the two continents justifies me in identifying those found in America as belonging to the same stage of culture to which the Chellian implement of France and England belonged, and, consequently, enables me to call them paleolithic implements.

James J. H. Gregory, Marblehead, Massachusetts, February 6, 1888. Has found *caches* containing half a peck one foot below surface.

J. F. Frisbie, M. D., Newton, Massachusetts, February 16, 1888. Has none. Newton Natural History Society has a few. They are found quite abundantly in this vicinity. Many Indian relics found in this city and adjoining town—Watertown.

Samuel Henshaw, Boston, Society Natural History, Berkeley street, Boston, Massachusetts, February 9, 1888. Has no rude implements. "Our collection was presented to the Museum of American Archæology and Ethnology at Cambridge in 1867."

Samuel A. Green, Massachusetts Historical Society, 30 Tremont street, Boston, Massachusetts, February 14, 1888. Has a collection of rude implements, found at Groton and along the bank of the Nashau River.

E. J. Rockwood, Worcester, Massachusetts, February 27, 1888. Has no rude implements. Will spend next summer examining the valley of the Connecticut River near Mount Holyoke, and if successful will send specimens.

Jesse Fewkes, post-office box 509, Newton, Massachusetts, February 18, 1888. Has two hundred rude implements chiefly from Essex and Middlesex Counties, Massachusetts. Has many from shell mounds. Speaks of grooved ax found in moraine-deposit.

Frank A. Bates, Boston, Massachusetts, Fe bruary 23, 1888. Has no rude implements, and refers to F. A. Adams, 233 State street, Boston, Massachusetts.

F. A. Adams, Boston, Massachusetts, February 23, 1888. Response received May 21, 1889. Has about five hundred specimens; about one-fifth are perfect arrow and spear heads, of porphyry, quartz, flint, obsidian, agate, etc., from Concord and Plymouth, Massachusetts, and various States of United States; deposits accidental, and found on or near the surface, associated with other neolithic implements.

MEM.—It is evident that this gentleman, like some others, has mistaken the implements inquired about, and so has misapprehended the questions.

Irving Holcomb, West Granby, Connecticut, February 8, 1888. Has five. Found a nest or *cache* containing a peck, 3 by 7 by ¼ inches, 2 feet under ground. Such as described in Abbott's Primitive Industry, page 195.

Irving Holcomb, West Granby, Connecticut, February 15, 1889. * * * "The rude stone implements I wrote about were found as follows: One on the bank of Salmon Brook, in the town of Granby, Connecticut. The specimen is of flint, and was found on a terrace. All other chips and unfinished specimens I have were found on the surface in plowed fields—all in different places. I have one rare specimen which is finished and was found about 12 feet below the surface nicely packed in with about twenty others of same shape, but different sizes, near Salmon Brook, on a place where arrow-heads were made." Has but one, which he bought.

G. L. Faucher, West Winsted, Connecticut, February 9, 1888. Has none and knows of none. Will explore the State in the spring and will notify us if he finds anything.

Rev. Jeremiah Zimmerman, Syracuse, New York, February 15, 1888. No information.

Rev. W. M. Beauchamp, Baldwinsville, New York, February 7, 1888. Has a collection. Will answer more fully later.

J. H. Norton, Plainville, New York, March 2, 1888. Has about two hundred, all of chert; found on the surface in Onondaga, Cayuga, and Oswego Counties. Has twenty-eight implements from a *cache* of fifty turned up by the plow. None in mounds. Deposit accidental.

Dr. Julius Pohlman, Museum Natural Science, Buffalo, New York, February 7, 1888. Has none in the museum and knows of none in the vicinity.

Edgar J. Klock, East Schuyler, New York, April 2, 1888. Has very few, in fact but one that is well defined, which he obtained from J. R. Nissley, Ada, Ohio.

Prof. Frederick Starr, Auburn, New York, June 26, 1888. Has one rude implement of argillite, found on the banks of the Delaware River, eastern Pennsylvania, 7 miles above Easton, near mouth of Martin's Creek. Probably a surface find. Arrow-heads of same materials and much affected by weather are not uncommon there.

D. S. Kellogg, M. D., Plattsburgh, New York, February 14, 1888. Has many rude and unfinished implements, but none that he considers as real paleoliths. None found in river drift. Can duplicate all our specimens.

George R. Howell, Albany, New York (no date). Has none, but thinks there are some in the New York State Museum in Albany. We should apply there.

C. M. Boughton, East Schuyler, New York, February 16, 1888. Has no collection, having sold it. But he has found these specimens in different places in the western part of this State. Will collect specimens if we wish from a sand-hill near.

Norman Cole, Glens Falls, New York, February 6, 1888. Has two hundred from this vicinity. In the valley of the upper Hudson, foot of Adirondacks, and near shores of lakes and streams.

James Angus, West Farms, New York City, February 10, 1888. Has some rude and unfinished implements from West Chester County, New York, and some from New Jersey. Gives large outline drawings.

C. H. Chapman, 364 and 366 Broadway, New York, February 14, 1888. Has none. Mr. J. Harris, Waynesville, Ohio, has them.

Arthur Hollick, recording secretary Torrey Botanical Club, Columbia College, New York City, February 15, 1888. Has none.

Natural Science Association of Staten Island, New Brighton, New York, February 16, 1888. No rude implements. Do not know of any having been found in this county; all thus far discovered belong to the shell-mounds.

Dr. C. C. Abbott, Trenton, New Jersey, but written at Cambridge, Massachusetts, February 15, 1888. (Answers for Professor Putnam.) Has thousands of implements of paleolithic character from various localities. Has the Abbott Collection from the Trenton gravels, but can give no approximation as to number. Would take a month to make a list.

Samuel Jackson, Freehold, New Jersey, March 19, 1888. His collection is in the Peabody Museum at Cambridge. Has three specimens like No. 10086—Utah, several like No. 5931—Maryland; found under the roots of a tree 18 inches deep in Monmouth County,—possibly a *cache*. He mentions a find containing a large number of specimens standing perpendicular and arranged in circles. One or two of these are in the Lockwood Collection at Cambridge, Massachusetts.

Frank D. Andrews, Vineland, New Jersey, February 18, 1888. Has found many of hornstone in Schoharie County, New York, but has sold his collection. Will try and collect some this summer.

Robert H. Engle, Moorestown, New Jersey, February 20, 1888. Has fifty. Material greenstone and quartz. Found on the surface in Watauga County, North Carolina, Burlington County, New Jersey, Summit County, Ohio, and Davidson County, Tennessee. Collection packed up; when unpacked will send duplicates.

Andrew Sherwood, Mansfield, Pennsylvania, March 27, 1888. Can not say how many rude implements he has in his collection. Writes about the "Puzzling Cobbler."

T. M. Nesbit, Lewisburgh, Pennsylvania, June 20, 1888. Has a great many rude stone implements of flint, found in the drift and bowlder clay.

A. F. Berlin, Allentown, Pennsylvania, February 11, 1888. Has twelve, eleven of quartzite, one of yellow jasper; found on the surface in the city of Reading, Pennsylvania, on the banks of the Schuylkill, on islands, and five or six from Allentown, Pennsylvania. See article in American Antiquarian, vol. I, No. 1, page 10, and article by Dr. W. J. Hoffman, American Naturalist, Vol. XIII, No. 2, page 108.

S. S. Rathvon, Lancaster, Pennsylvania, March 22, 1888. Has about three hundred and fifty, including all kinds. Material gray quartzite, white quartz, chert, jasper, hornstone, etc. Found along the banks of the Susquehanna and Conestoga Rivers and adjacent creeks and in plowed fields. Also found with fragments and chips, as if there had been places of manufacture. Have been described in the Transactions of the American Philosophical Society, 1878, pages 351–368.

G. W. Brodhead, Water Gap House, Delaware Water Gap, Pennsylvania, February 10, 1888. Has a number of hornstone, chert, yellow and brown jasper, silicious slate, and white quartz; found north and south of the Gap, always in the valley and on the surface. None found in mounds. Hornstone is found 1 and 2 miles north of Water Gap in a bed of Oriskany sandstone, yellow and brown jasper, from quarry near Easton, 24 miles south. Franklin Peale used to gather them twenty years ago.

H. L. Simon, Lancaster, Pennsylvania. Has a collection, but it is packed up. The material is flint and jasper; found on the surface at Mill Creek and Tumbury (?) Hill, on Susquehanna River.

Charles H. Stubbs, M. D., Wakefield, Pennsylvania. Has twenty-four. Sent *many* to Lehigh University, Pennsylvania. Peter Hiller, Conestoga Center, Lancaster County, has a collection. Material trap rock and sandstone; found on the surface at Caldwell's Island, Susquehanna River, and near Gap, in Lancaster County.

Oliver D. Schock, Hamburgh, Pennsylvania, April, 1888. No information.

G. S. Lamborn, Liberty Square, Pennsylvania, February 9, 1888. Has seven specimens of hard brown sandstone, black trap, quartzite, gray and black jasper. Surface finds from the banks of rivers and in plowed fields. No duplicates.

George S. Lamborn, Liberty Square, Pennsylvania, February 7, 1889. Since writing last has come in possession of a stone implement—very hard—of ash color, with small end somewhat broken. Inclosed a sketch. The dotted lines were probably the original edge, tolerably sharp. The outside lines were drawn looking at it the broad way; the inside are looking against the edge. The sketch is full size. He has never before seen one like it. It was found at McCall's Ferry, Lancaster County, Pennsylvania.

Rev. W. M. Taylor, Mount Jackson, Pennsylvania, April 12, 1888. Has but few rude implements. Will look for some this summer.

Norman Spang, Etna, Pennsylvania, February 6, 1888. Has had many hundreds.

F. W. Brown, Glen Rock, Pennsylvania, February 7, 1888. Has none and knows of none.

C. John Hexamer, 419 Walnut street, Philadelphia, Pennsylvania, February 7, 1888. Has none.

S. H. Zahm, Lancaster, Pennsylvania, February 27, 1888. Has six hundred rude implements, principally of gray stone or trap rock, white quartz, jasper, and flint, found on the banks of the Susquehanna River and in plowed fields in Pennsylvania and Maryland, and in Florida on the banks of a lake, associated with arrow and spear points, axes, etc. Deposit seemed accidental. Has some which he would exchange for objects not in his collection.

George H. Clapp, Pittsburgh, Pennsylvania, February 7, 1888. Has thirty of argillite and flint, found on the surface in the Ohio River Valley, 13 miles below Pittsburgh, associated with chips and finished arrow and spear heads. Deposit seemed accidental.

I. S. Geist, secretary Natural History Lyceum, Marietta, Pennsylvania. (No date.) Has none.

J. D. McGuire, Ellicott City, Maryland, February 9, 1888. Has about three hundred of quartz or quartzite, found on the Eastern Branch Potomac River, District of Columbia; Patapsco River near Relay, Baltimore and Ohio Railroad, Maryland; South River Neck, Anne Arundel County, Maryland, and a few from his farm, Howard County, Maryland. Found on surface at high flood-line of these streams. Has a *cache* of twenty from Anne Arundel County. Ten feet away was another *cache*. One *cache* of one hundred; one of twenty-six. All of the *cache* implements found near oyster-shell heaps.

MEM.—May not these belong to the prehistoric man who made the shell heaps? There are believed to have been two epochs of prehistoric culture represented in the kjoekenmoddings of Denmark. The shell heaps of America should be carefully examined for evidences of paleolithic man or for an earlier epoch than the neolithic period.

O. N. Bryan, Marshall Hall, Maryland, February 23, 1888. Sent a large number to the Smithsonian Institution last spring.

E. Stanley Gary, Baltimore, Maryland, February 6, 1888. No information.

Otis Bigelow, Avenel, Maryland, February 8, 1888. Has already deposited his collection in the Smithsonian Institution. Knows of workshop on the Mattapony in Guineys, Caroline County, Virginia.

Alexander C. Black, Army Medical Museum, Washington, District of Columbia, February 10, 1888. Has none. Has given all his specimens to the Smithsonion Institution. All were surface finds from Randolph County, Indiana. Never found in mounds.

Albert S. Gatchet, Washington, District of Columbia, February 7, 1888. Has none. Sends lists of museums in Switzerland.

Dr. H. C. Yarrow, Washington, District of Columbia, February 6, 1888. Has sent his circular to William Hallet Phillips, esq., of Washington.

John J. Hayden, 1325 K street, Washington, District of Columbia. No collection.

George H. Moran, M. D., Morgantown, North Carolina, February 23, 1888. Has none, but could find. Will seek. Has sent objects—"Gila monster"—to Professor Baird.

G. B. Lartique, M. D., Blackville, South Carolina, February 11, 1888. Has none.

S. E. Babcock, Chester, South Carolina. Has none.

J. C. Neal, M. D., Archer, Florida, February 10, 1888. Has twenty or more specimens of stone darts. A mound was opened on Tallapoosa River, farm of William R. Jordan, by a freshet. Large quantities of pottery, skulls, implements, etc., of silver and bronze were found.

Prof. N. T. Lupton, Auburn, Alabama, March 12, 1888. Has none.

C. M. Luttrell, Oxford, Alabama. Has none. A private collection at Taladega, Alabama, is for sale; owner dead.

J. P. Stelle, Mobile, Alabama, March 19, 1888. Does not know of any rude implements. Has lately been along the Gulf coast in Baldwin County, Alabama, and found the region very rich in aboriginal remains; two or three different races seem to be well represented. There are many large mounds, none of which seem to have been explored. The finest pottery he has yet met with is there; light and well baked.

Prof. G. F. Wright, Oberlin Ohio. Has four from Dr. Abbott.

E. T. Nelson, Delaware, Ohio. Has six hundred rude implements of flint; a large proportion were found in a single pocket or *cache* near the dividing line of Knox and Coshocton Counties in this State.

M. C. Read, Hudson, Ohio, February 7, 1888. Found about seventy-five mingled with animal bones and fragments of pottery in a rock shelter in Boston township, Summit County, Ohio. See Smithsonian Institution Report 1879, page 439.

G. W. Hornisher, Camden, Ohio, February 14, 1888. Has several paleolithic implements; never counted them; material, chert; found on the surface along the east branch of White Water River.

D. F. Appy, Granville, Ohio, April 28, 1888. Has sixty-three rude implements of flint or hornstone; found mostly on the surface in Licking County, but have found twenty-two in mounds within a radius of 4 miles of this place.

MEM.—But these are not paleolithic.

S. M. Luther, Garrettsville, Ohio, March 5, 1888. Has sixty rude implements, chiefly of chert; a few of quartzite; nearly all found on the surface. There are quite a number of what Dr. Abbott terms "Turtlebacks." All found within a radius of 20 miles of this place.

Henry W. Hope, Paint post-office, Ohio, June 5, 1888. Has twenty rude implements of flint or other fine-grained stone; found on the surface in Highland County, Ohio, and not associated with any other relics.

Robert Clarke, Cincinnati, Ohio. Has none.

J. F. Henderson, Newville, Ohio, March 15, 1888. Has no information.

W. M. Cunningham, Newark, Ohio, April 10, 1888. Has twenty-five rude implements, principally of flint; found on the surface and in mounds or earth-works in Licking County, Ohio, associated in some cases with arrow and spear points, axes, etc. Deposits apparently both accidental and intentional. Collection not in shape for exchanges.

John P. McLean, Hamilton, Ohio, February 23, 1888. Has a few of dark blue chert; found on the surface in Butler County, Ohio. In section 24, Hanover township, of this county, is a field where great numbers have been found. "If you request will try and find some more."

Dr. W. B. Rosamond, Milnersville, Ohio, February 10, 1888. He will send fifty or seventy-five found here on the surface. Will exchange for publications.

George W. Dean, Kent, Ohio, February 8, 1888. Has thirty-one rude implements of chert, from 3 to 4 inches in length by 1½ to 2¾ in width by ½ to 1 inch in thickness. From Trumbull, Portage, and Summit Counties, Ohio.

Dr. Herbert Twitchell, Hamilton, Ohio, March 23, 1888. Has nothing paleolithic. Sent tin-type of large spear-head.

A. P. Pease, Massillon, Ohio, March 24, 1888. Has ninety rude chipped implements of colored chert, varying in length from 2 to 5 or 6 inches, given him by farmers who plowed them up. Can exchange twenty for publications on this subject. Expects to get a *cache* of flints, found while digging a ditch. He has the largest private collection in this county (Stark), numbering over one thousand specimens, which he will sell for $500 cash.

I. H. Harris, Waynesville, Ohio, February 11, 1888. Has two or three hundred "*chips* and unfinished implements." All from Fort Ancient.

R. T. Manning, Youngstown, Ohio, March 5, 1888. Has twelve rude implements of flint; found in southern Ohio.

James H. Smith, Licking County, Pioneer Historical and Antiquarian Society, Newark, Ohio, February 8, 1888. Has none and knows of none.

Horace P. Smith, custodian Cincinnati Society of Natural History, 108 Broadway, Cincinnati, Ohio, April 10, 1888. Has but a small number of these implements in the collection. Cannot be sent for verification without the action of the executive board of the society.

John H. Lemon, New Albany, Indiana, February 14, 1888. Writes from Escondido, California. Has one hundred paleolithic implements of white, red, and gray flint; found on the surface near falls of the Ohio.

T. L. Dickerson, Fairfield, Indiana, February 13, 1888. Has many of these rude implements of chert, sandstone, sometimes of bastard granite, and striped slate; found on the surface near springs, camp sites, etc., and associated with broken implements and chips, indicating shops and manufactories. Deposit accidental, except where *cached*.

E. L. Guthrie, Adams, Indiana, February 20, 1888. Has a few very fine specimens (not paleolithic), found on the surface in this county (Decatur), Indiana. Sends many tracings of fine implements. Will not part with them—but gladly loan for comparison.

William W. Borden, New Providence, Indiana, March 23, 1888. Has quite a large collection of stone implements of various kinds. Has purchased several cabinets. Has the collection of the late Dr. James Knapp, of Louisville, Kentucky. Will forward some specimens soon.

C. S. Arthur, Portland, Indiana, March 20, 1888. Has seventy-five of flint; found on the surface in different localities in Jay County. A nest, or *cache*, of sixty were uncovered by the plow about 5 miles from here. Another lot was found in Adams County, buried in sand. They have never been described.

E. Pleas, Dunreith, Indiana, February 10, 1888. Has one hundred rude implements. Can spare thirty or forty from Van Buren County, Arkansas, and thirty from Henry County, Indiana.

Charles H. Bryan, Muncie, Indiana, February 9, 1888. Has a number found on the surface in Logan and Hancock Counties, Ohio, and Jay County, Indiana. Has some like No. 768 and No. 8904. Could collect fifteen or twenty specimens to send. Has some which he will give.

John W. Linck, Madison, Indiana, February 17, 1888. Don't know anything about paleoliths, but Jesse Wagner has a petrified head of a buffalo.

William Robertson, Farmland, Indiana, March 20, 1888. Has over one hundred, mostly of granite; found on the surface in Randolph County, Indiana.

MEM.—Surely not paleolithic.

D. A. K. Andrus, Rockford, Illinois, February 7, 1888. Has none and knows of none.

George E. Sellers, Bowlesville, Illinois. (No date.) The rude unfinished implements are very abundant in southern Illinois, more so in the more recent out-door workshops than in the mounds or the shops connected with them, and, in most cases, appear to be modified cores.

Dr. Merit L. Saunders, Thompson, Illinois, February 8, 1888. Will send arrow-points, chips, etc.

H. S. Hackman, Peru, Illinois, February 26, 1888. Has but few. His collection consists of higher finished implements. Has a steel spear found in a mound. Believes discoidal stones were used as mortars—has one with pestle fitting in it.

R. T. Miller, South Bend, Indiana, March 9, 1888. Has about one hundred rude implements; found on the surface near this place, in isolated localities. Sends photograph of image carved from gray sandstone.

C. L. Obst, Pittsfield, Illinois, March 20, 1888. Has a few rude implements of white and pink flint and jasper. Surface finds. Ten years ago found one of them in a drift-bed not less than 75 feet in height, in Calhoun County, Illinois. Never found any in mounds, tombs, Indian graves, or ancient structures of any kind.

George Newcomer, Franklin Grove, Illinois, March 2, 1888. Has twenty-four rude implements; twenty of white chert found on the surface in Whiteside County, and four of quartzite from Carroll County, Illinois.

John Brady, Aledo, Illinois, February 11, 1888. Has forty-five paleolithic implements of flint, some of which are light colored, others are blue and gray; found on the surface in Mercer County, Illinois.

E. H. Hamilton, Petersburg, Illinois, February 22, 1888. Has forty or fifty rude implements of white, yellow, and dark blue flint; found on the banks of the Sangamon River, associated with flint chips, broken pottery, etc. Identical with Nos. 5900, 9767, 11535.

William McAdams, Alton, Illinois, February 12, 1888. Has a number; found in river gravels alongside of Devonian and Silurian fossils.

John B. Tscharner, Champaign, Illinois, Feb. 11, 1888. Has six rude implements of white and dark flint; found on the surface in Washington County, Illinois, associated with flint arrow and spear points. Deposit seemed accidental.

D. F. Hitt, Ottawa, Illinois, February 27, 1888. Has very few; never thought them worth saving.

M. Tandy, Dallas City, Illinois, March 19, 1888. Has three rude implements of flint and others of various kinds, amounting to twenty-five specimens; found on the surface in this vicinity. Has, with very few exceptions, sent all the results of his collecting to the Smithsonian Institution.

Lawson S. Bliss, Dallas City, Illinois, February 13, 1888. Has a number of rude and unfinished implements. Has a large collection of arrow and spear heads, stone axes, etc. Is adding to his collection with intent to present to the Smithsonian Institution. Look at Mr. Tandy's collection already presented. Many mounds here.

James Shaw, Mount Carroll, Illinois, February 10, 1888. Has sent rude specimens to the Smithsonian Institution. Will send more in the early spring and summer.

W. H. H. King, Jacksonville, Illinois, April 25, 1888. Has one hundred implements of chert; found mostly on the surface in Morgan, Calhoun, and Pike Counties, Illinois. Forty specimens were taken out of a pocket or *cache*.

Dr. J. F. Snyder, Virginia, Illinois, April 30, 1888. Has nearly one hundred rude implements of white flint, found on the surface in Cass County, Illinois; also about thirty rude flints from Schuyler County, Illinois, and eight specimens somewhat resembling the District of Columbia specimens figured, of black slaty quartzite, plowed up in one deposit. Several flints from Saint Clair County, Illinois; ten of white cherty quartzite from Pettis County, Missouri; fifteen from Jefferson County, Missouri; eighteen of brown vitreous flint from Travis County, Texas; nine of pink and white novaculite from Garland County, Arkansas.

John E. Younglove, Bowling Green, Kentucky, February 9, 1888. Has twenty or twenty-five rude implements principally of blue flint, found in this region on the

surface, not in mounds. They are not regarded as valuable. Gave Professor Ward, of Rochester, forty specimens. Sends photograph of human bone (femur) pierced with flint arrow; highly interesting specimen.

J. G. Cisco, Jackson, Tennessee, February 9, 1888. Has twenty implements of gray quartz, most of them found on the surface (a few from mounds) in Madison County, Tennessee.

Benjamin F. Bush, Grand Blanc, Michigan, February 18, 1888. Has many pieces like illustrations in circular 36.

Miss F. E. Babbitt, Coldwater, Michigan, February 21, 1888. Has a large number of specimens which are misplaced or lost. Material, quartz. They are found in the gravels at Little Falls, Minnesota. Will try and get some this summer.

F. C. Clark, A. B., 42 Madison street, Ann Arbor, Michigan, February 15, 1888. Has some rude stone implements resembling those in circular 36. One from sand and gravel pit 12 feet under the surface, looks like "bath brick" rudely flaked. Studied archæology for ten years under Professor Winchell.

R. H. Tremper, M. D., Albion, Michigan, February 9, 1888. Has about one hundred and fifty rude implements.

N. Y. Green, Battle Creek, Michigan, March 16, 1888. Has twenty rude implements of flint, slate, and a kind of sandstone or sandy slate. All found on the surface in that locality. Drift formation.

Charles E. Barnes, Lansing, Michigan, January 9, 1888. His collection is boxed at Battle Creek. Has not seen it for four years.

C. L. Mann, 27 Erie street, Milwaukee, Wisconsin, February 6, 1888. All our collections contain them, but they are considered of small value. Has forty or fifty copper implements for sale. Will send photographs. They were uncovered by a storm—cyclone.

E. L. Brown, Durand, Wisconsin, February 17, 1888. Has one of bluish hornstone; found on the surface. He knows a Methodist preacher who has a collection of seventy-five. Does not know where he is. They were plowed up and said to have been placed on their edges close together.

W. M. Wheeler, Milwaukee, Wisconsin, May 4, 1888. Custodian of Public Museum. Has twelve rude implements of flint in the Museum collection. Surface finds. Will not part with any.

John Hume, Eglinton Place, Davenport, Iowa, February 25, 1888. Wants more time to examine the authorities.

Thomas J. Tidswell, Independence, Missouri, April 2, 1888. Has thirty rude implements of dark blue and gray flint; found on the surface in Jackson County, Illinois, associated with scrapers, perforators, hammer-stones, arrow-points, etc. Deposit seemed accidental. Will send twelve or fifteen.

Charles J. Turner, Brunswick, Missouri, March 20, 1888. Has a few mostly of flint. Some from mounds, some from the surface.

George J. Engelman, M. D., 3003 Locust street, St. Louis, Missouri, February 7, 1888. Has a large number of rude implements of red brownstone similar to porphyry. Surface finds from southeast Missouri. Deposit accidental. No one values them.

Sid J. Hare, C. E., Kansas City, Missouri, April 1, 1888. Has twenty rude implements of flint; found on the surface, in plowed fields, associated with arrow-points and stone axes, in the vicinity of Kansas City. Deposit seemed accidental. None found in mounds. Will send specimens next fall.

G. C. Broadhead, Columbia, Missouri, February 9, 1888. Has twenty of white chert, hematite, and porphyry. Surface finds from Missouri, Kansas, and Texas. Will not part with them.

W. Albert Chapman, Okolona, Arkansas, February 13, 1888. Has fifty points, from crude to perfect, also masses of chipped material, such as hornstone, flint, lydian stone, jasper, transparent quartz, quartz (various shades of white) gneiss, and mica schist. The specimens were found on the surface and down to 6 feet below, singly, and associated with chippings, broken and unfinished points, and other tools or im-

plements, in Clark, Nevada, Pike, Howard, Sevier, Polk, Hot Springs, and Montgomery Counties, Arkansas.

R. R. Smith, Fordyce, Arkansas. Has several dozen of rude and unfinished implements of flint of various colors. Found on the surface all over the country, but mostly near creeks and rivers, and also in mounds. Other objects found with them.

J. L. McInnis, College Station, Texas. Gives no information.

Dr. H. H. Thorpe, Liberty Hill, Texas, February 11, 1888. Has none. Has heard of but never gathered them. Has some mound relics which he will forward.

Stephen Bowers, San Buenaventura, California, April 18, 1888. Has fifty of chert, quart, agate, jasper, chalcedony, obsidian, porphyry, and basaltic rocks; found on the surface on old village sites, and sometimes buried with mortars, pestles, bowls, pipes, spear-points, and shell and bone implements. Only occasionally deposited with the dead.

Mrs. R. F. Bingham, corresponding secretary of the Society of Natural History, Santa Barbara, California. Has none and nothing similar. Has mortars, arrows, etc., found in graves—here and on adjacent islands.

H. F. Emerie, auditing department, Wells-Fargo Express, San Francisco, California, February 24, 1888. Has no collection. Knows the implements; material black flint; found all over California.

E. J. M. Knowlton, Big Lake County, Minnesota, February 20, 1888. Has nothing.

William Middagh, Rollag, Minnesota, March 6, 1888. Has nothing.

George W. Seymour, Taylor's Falls, Minnesota, February 16. Has none, but knows of mounds in his neighborhood which could be opened.

A. F. Davidson, Croston, Oregon, April 8, 1888. Has nothing.

William Cuppage, Winfield, Kansas, February 23, 1888. Has no rude implements. Sent his collection of stone implements to his sister in Ireland and his last copper ax to the Smithsonian Institution.

A. R. Bodley, Ohio Township, Franklin County, Kansas. Has two hoes and a pestle; nothing else. They are now in the University, Ottawa, Franklin County, Kansas.

T. M. Shallenberger, Bradshaw, Nebraska, February 9, 1888. Has very few of paleolithic type. Will forward in time what he has and agree upon exchange.

Clark F. Ansley, Lincoln, Nebraska, April 20, 1888. Has forty rude implements of clear quartz, flint, and greenstone.

Lewis A. Kengla, M. D., Tucson, Arizona, March 29, 1888. Letter of this date refers to collections from the District of Columbia which was left at his father's house. Can give no information as to numbers.

E. L. Berthoud, Golden, Colorado, March 6, 1888. Has seven implements from his neighborhood. Sent some to the Smithsonian Institution.

A. L. Siler, Ranch, Utah, February 21, 1888. Has none.

David Boyle, curator of museum, Canadian Institute, Toronto, Canada, February 8, 1888. Has one hundred rude implements of chert; found all over the province from 8 to 10 inches below the surface associated with implements of a more highly finished type. Can not send specimens. Refers to writer's report in the printer's hands.

# A PRIMITIVE URN BURIAL.

By Dr. J. F. SNYDER, *Virginia, Cass County, Illinois.*

On the broad alluvial plain in the southeastern part of the State of Georgia, through which the Altamaha river takes its course to the sea, at a point a mile and a half north of that stream and nearly a mile from the Savannah, Florida and Western Railway, there is a small natural elevation of the ground rising a few feet above the general level of the river valley. On the top of this higher ground is one of the numerous Indian burial mounds of that region, measuring some 25 or 30 feet in diameter at the base and 8 or 10 feet high at its center. In February last (1890) in making an excavation in the western edge of this mound—not for archæological investigation, nor by archæologists,—a few inches below the surface the spade broke into a hollow, spherical-looking object that, on inspection, proved to be the round bottom of a large earthen pot which had been buried there bottom up. The solid, hard-packed earth in which it was imbedded was then carefully removed and the vessel was lifted out of its long resting place. Much to the surprise of the explorers another quaint earthen vessel was discovered within the larger one. This smaller one was standing upright on the natural surface of the ground, securely covered and inclosed by the large pot that had been placed inverted over it, affording it perfect protection from moisture as well as from the pressure of the earth forming the mound heaped over it (Fig. 1.) On examining the smaller vase it was found to be nearly half full of fine white ashes interspersed with calcined fragments of human bones, comprising the charred teeth and cremated skeleton of an adult individual. Lying on the surface of these remains were a quantity of small perforated bone beads (wampum), among which I discovered, uniform in size with the beads, several small pearls that had been pierced through the center for the purpose of stringing, with the beads, in the form of a necklace or other ornament. Whether the mound presented any peculiar features in its construction I have been unable to learn; and no further exploration of it has, to this time, been made.

The large pot, which I have succeeded in completely restoring (Fig. 2) is bell-shaped, quite symmetrical in proportions, and measures $15\frac{3}{4}$ inches in height and exactly the same in width across the mouth. It

is made of compact clay, unglazed, hard burned, and of the uniform thickness of a fraction more than the fourth of an inch. About the bottom, both inside and out, it presents by discoloration unmistakable evidence of having been subjected repeatedly to the action of fire, probably for cooking food. Its internal surface is very even and regular and has the appearance of having been smoothed by the hand, as finger marks are faintly discerned, particularly about the upper portion. The outside is roughened by being ornamented all over with a continuous repetition of the peculiar design shown in detail in Fig. 3, which doubtless was impressed upon the soft clay, before it dried, with a stamp cut in *intaglio*, thus leaving the figure on the vessel in relief, or "raised."

The smaller vase, in which the ashes of the dead had been deposited, is plain, smooth inside and out, glossy black in color, though not glazed; is thinner and more compact in texture than the large one, looking, at first glance, as if molded of papier mâché. It is free from ornamentation of any sort, and was burned hard after drying. In Fig. 4 it is represented, as is also the covering vase (Fig. 2), one-eighth actual size. Obtusely pointed at the bottom, of conoidal form, it rapidly enlarges to near the top, and contracts again for an inch and three-fourths to the mouth; graceful in contour, and almost mathematically true and regular in every proportion; it is 13 inches broad at the widest part, 11½ inches high, and 11½ inches across the opening. The fact that in each of these earthen vessels their height and diameter across the mouth are exactly equal in measurement may be only an accidental coincidence, but would seem to indicate that certain definite principles or rules in the plastic art guided the ancient potters in shaping their vessels.

We are reasonably sure that the wheel and lathe were unknown, as appliances in the manufacture of pottery, to the primitive American Indians. But they must have employed adequate substitutes for them; for without mechanical aids of some description the wonderful proficiency attained by some of the tribes in the ceramic art is difficult to explain. In the early settlement of the country, about the saline springs in Southern Illinois, Western Virginia, and other localities, numerous fragments of very large earthen vessels were found scattered about over extensive areas adjoining, many of them, when entire, 3 or 4 feet in length or in diameter and a foot or more in depth. They doubtless were made and used by the Indians as evaporating pans for obtaining salt from the salt-impregnated water of the springs. These rude earthen kettles were plain on the inside, but invariably bore on the outside the distinct impression of some kind of woven fabric. They excited the curiosity and astonishment of the backwoodsmen; and, at a later time, taxed the ingenuity of the scientist to discover the method by which the ancient artisan shaped and manipulated such unwieldy masses of soft clay and supported them in place while drying. This problem was solved satisfactorily a few years ago by Mr. George E. Sellers. In his valuable paper on "Aboriginal Pottery of

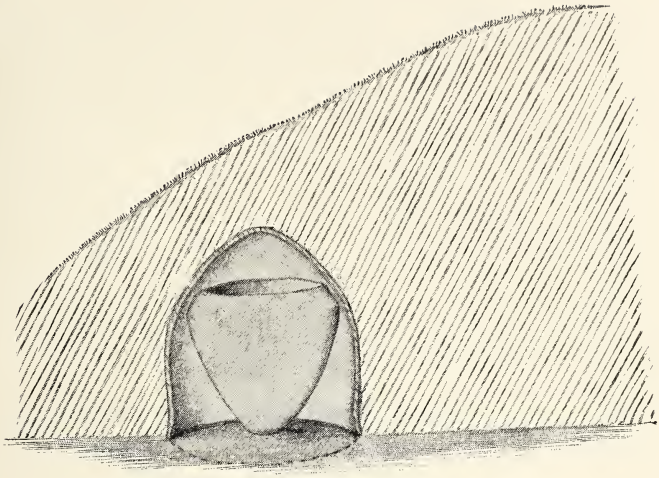


FIG. 1 ($\frac{1}{16}$).

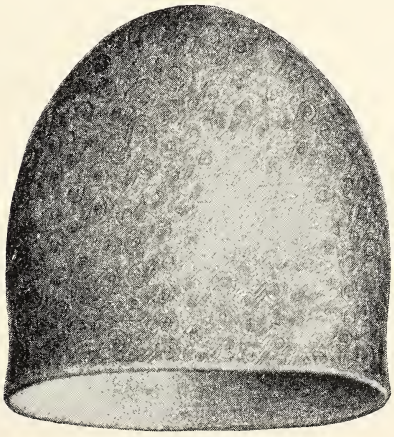


FIG. 2 ($\frac{1}{8}$).

SNYDER: PRIMITIVE URN BURIAL.

FIG. 3. ACTUAL SIZE.

FIG. 4 ($\frac{1}{8}$).

the Salt Springs in Illinois,"* he quoted the opinions of the late distinguished antiquarians, J. W. Foster, LL. D., and Dr. Chas. Rau, that "the earthenware has evidently been molded in baskets," an impracticable method because of the impossibility, as Mr. Sellers points out, of "keeping in form and lining with heavy clay fragile baskets of the large size of these old salt kettles." He then states, "I discovered (at the salt springs near the Saline River, in southern Illinois), what at first I took to be an entire kettle bottom up; but on removing the earth that covered it, it appeared to be a solid mass of sun-dried clay. From its position among heaps of clay and shells, its hard, compact, discolored—I may say almost polished—surface, I became satisfied it was a mold on which the clay kettles had been formed, precisely as in loam-molding at the present day." The soft clay was retained in proper position on the mold with bandages of coarse textile fabric that left their impression on the pottery, similar to the imprint that baskets of the same texture would make if the plastic clay had been pressed against their inner surface. This very simple method of casting the large salt kettles—on the outside of the pattern—was probably the same adopted in making the larger of the two pieces of pottery from the Georgia burial mound (Fig. 2.). In its construction the clay when soft must have had firm support on the inner side to resist the pressure necessary to imprint its exterior surface with the carved type. When dried sufficiently to retain its form the vessel may then have been lifted from its mold and smoothed on the inside with water and the open hand. In shaping the smaller vase the thin sheet of tough clay was no doubt taken off the molding block while yet pliable and its upper margin drawn in gradually by careful manipulation. A slightly wrinkled appearance of the indrawn margin of the opening bears evidence of this process.

There is no good reason for believing that these two pieces of earthenware were made purposely for the inhumation of the incinerated remains they finally inclosed, though they are in every respect so remarkably well adapted for that use. By placing the conical vase upright on a support a little more than an inch in thickness, and inverting the large pot over it, the receding rim of the vase exactly fits in the curving side of the pot, as is shown in Fig. 1; the one covering the other so accurately as to well nigh exclude the passage of air between the parts in contact. And this, I have been informed, was their relative position when recovered from the mound. This vase, though "new" and exhibiting no indications of previous use, is of a type—*Amphora*-like—quite common among the earthenware of the pottery-making pre-Columbian Indians. The large pot, or kettle, as before stated, bears evident marks of long-continued use in domestic or culinary service.

* Popular Science Monthly, 1877, vol. II, p. 573, *et seq.*

The exterior ornamentation of this large kettle is shown in detail, drawn of actual size, by Fig. 3. The dark lines are in relief, standing out level with the original surface of the clay when molded; the white spaces show the face of the carving that sunk its impression, the sixteenth of an inch in depth, in the yielding mass. It will be observed in this unique design that a well-defined cross appears in each circle surrounded by the intricate scroll-lines. The figure of the cross is by no means uncommon in the works of art of the ancient races inhabiting America before the historic period. It has been found fashioned in stone and copper, engraved on shell and bone, and in colors on pottery vases and bottles—not to mention the famous carving at Palenque. Its presence among the relics of the mounds has occasioned much speculation and discussion, in the main with no other basis than ludicrous flights of the imagination. At this late day the fanciful theory of a pre-Columbian propagation of Christianity in America by the Apostle Saint Thomas, supported at one time by such distinguished scholars as Professor Tiedemann, is scarcely worth a passing notice. "It has been shown by the preceding examples," remarked Dr. Chas. Rau,* which could be multiplied, if it were deemed necessary, that the cross was recognized as a symbol among the more advanced nations of America." Gomara says the knowledge of the cross as a religious emblem had penetrated all Spanish America before its discovery and conquest; and adds, "This veneration of the cross made them (the Indians) more ready to adopt the Christian symbol." This rubbish has vanished before the march of archæological science, together with the grandeur and splendor of the "cultured, semi-civilized mound builders." The "sign of the cross," carved and sketched by the early mound-building Indians, is now properly considered a meaningless figure of ornamentation adopted by crude savages because of its simplicity of execution. This advanced opinion is well expressed by Prof. F. W. Putnam, in mentioning a copper ornament of cross shape found in an old Indian grave in Tennessee. He says: "I think it must be placed in the same category with the 'Tablet of the Cross' at Palenque, and be regarded as an ornament made in its present form simply because it was an easy design to execute, and one of natural conception."

Known instances of the preservation of *cremated* human remains in earthenware vases, by our prehistoric Indians, are very rare. It was the custom of some tribes to burn their dead collectively. "The practice of reserving the skeletons," says Col. C. C. Jones, LL. D.,† "until they had multiplied sufficiently to warrant a general cremation or inhumation seems to have been adopted." They were then burned all together and the seething pyre was covered with earth, heaped up into a mound, to be never again disturbed. "Burial vases," he adds, "inclosing human bones (not burned) have occasionally been found in the grave mounds of

* The Palenque tablet, p. 42. † Antiquities of Southern Indians, p. 190.

Tennessee, Alabama, Florida, Mississippi and South Carolina." And he relates, on pages 455, 456 of his valuable work, a very interesting account of the recovery from a small shell mound on Colonel's Island, in Liberty County, Georgia, of a burial urn, inclosed in two others, containing the bones of a young child.

The urn-burial from the Altamaha mound—the subject of this paper—is original in design and remarkable for its ingenious simplicity. The pottery-ware is practically imperishable; and sealed almost hermetically, as were the ashes of the dead they contained, in that region where frost is scarcely known, they must have endured forever but for some convulsion of nature—or the implements of civilization. The presence, in the funeral vase, of small pearls with the wampum beads, and the chalk-like condition of both, attest the antiquity of this singular sepulchral deposit. Pearls were worn as personal ornaments in great profusion by the Indians of eastern Georgia when De Soto came among them, in 1540. The Gentleman of Elvas says that 14 bushels of them were found by the Spaniards in one charnel-house at Cofachiqui. Pickett remarks, in his History of Alabama, "There can be no doubt about the quantity of pearls found in this State of Georgia, in 1540, but they were of a coarser and less valuable kind than the Spaniards supposed. The Indians used to perforate them with a heated copper spindle, and string them round their necks and arms like beads."

Centuries have passed, with their ceaseless changes, since the hands of affection placed those venerated ashes of the dead and bead ornaments in that mound-covered crypt of clay pottery; and they who mourned on that occasion have, ages ago, been resolved into dust; but in these simple relics, they left—as legible as though graven in letters on polished marble—a record of their crude religious feelings, of their child like faith and reverence, and of their very human yearnings for life everlasting.

NOTE.—Since this paper was written the mound in which the pottery vessels and incinerated human remains were found has been thoroughly explored; and nothing further was discovered but a bed of ashes and charcoal on the ground surface in the center of the tumulus.

# MANNERS AND CUSTOMS OF THE MOHAVES.

By GEORGE A. ALLEN, *Colorado River Agency, Colorado.*

Although the Mohaves are giving up many of their superstitions, some of them still cling to the teachings of their ancestors. They cremate their dead, the funeral pyre being made ready for the corpse as soon as life is extinct, and the body is placed on the pile of wood prepared, while all the friends and relations of the deceased gather around and set up a pitiful moan. Formerly they burned all the property of the deceased, and often the mourners would contribute everything they possessed to the flames, thereby showing the affection and grief they felt for the dead; but this custom is not much practiced at the present time. The women usually contributed a portion of their hair to the flames—that is, those who belonged to the immediate family of the deceased—and would even sometimes throw themselves on the fire, such was their grief.

While they have but little reverence, they believe there is a God, whom they call Mat-o-we-lia, and that He is the maker of all things; that He has a son, whom they call Mas-zam-ho, who is king of departed spirits. Mat-o-we-lia conducts the movements of the sun, moon, and stars; sends the rain, sunshine, etc. Mas-zam-ho has full charge of affairs in heaven, or "White Mountain," as they call it.

They believe the spirits of the dead go up to the "White Mountain" in smoke, and that all the property destroyed in the flames with the deceased will go with him to the "White Mountain," where pots are constantly boiling with something to eat.

They had formerly an annual burning of property, and all would contribute something to the flames in expectation of its going up to their departed friends. This practice is entirely discontinued on the reservation, but is still kept up by the Yumas at Fort Yuma, and by the Mohaves at Needles and Fort Mohave, off the reservation.

They also have a belief that all the Mohaves who die and are not cremated turn into owls, and when they hear an owl hooting at night they think it is the spirit of some dead Mohave returned. They are also superstitious about eating any kind of food that they are not accustomed to. They will not eat the meat of the beaver, claiming that if they did their necks would swell. This belief was brought about by

the circumstance of some one having poisoned beaver for their hides, and the Indians who ate of the flesh were poisoned and died; hence, they think all beavers are bad.

After one dies the friends do not eat salt nor wash themselves for four days. But these superstitions are fast disappearing, and in a few years most of them will have died out altogether. The medicine men are most instrumental in keeping them alive.

They formerly practiced polygamy, but this is now discontinued. Their marriage ceremony is a very simple one; they merely agree to live together as man and wife, seldom separating after such an agreement is formed.

They regard the hieroglyphics found on rocks as being the relics of some distinct race, of which they have no tradition whatever. Their animal nature, like that of all aborigines, predominates, and they are most happy and contented when they have plenty to eat. The children are rather bright and inclined to learn when their minds are not diverted by play. When allowed to recreate they play some kind of game from early morn until bed-time.

Some of the women do very artistic work in beads and pottery; they also weave matting from cottonwood bark. The mesquite bean is their principal food in winter; this they gather and put up in large willow baskets, which they place upon platforms for storage. The screw beans they put into a kind of kiln, and thus it goes through a sweating process before they are used. They have the metate for grinding wheat, corn, beans, etc.

Chief Hook-o-row is the head of the Mohave tribe, and he is a good, peaceable Indian, but not very progressive, being inclined to take life rather easy.

Like all Indians they have plenty of dogs, and will divide their last meal with them. The children are all called "Peet," until they arrive at about four or five years of age, when they are provided with a name.

They live in sweat-houses in winter and under open sheds in summer. Those who go to the railroad towns and mining camps soon become demoralized with whisky and contaminated by tramps.

With proper means of irrigation and instruction as to farming they would soon become a thriving community.

# ANTHROPOLOGY.

By Otis T. Mason.

## INTRODUCTION.

An exhaustive chronicle of Anthropology for the year 1885 would contain the account of a few general and a vast number of special works of great importance. A cursory view of the titles appended to this brief summary reveals the fact that new portions of the human frame, and new groups of human phenomena, are yearly brought within the area of scientific investigation. Hand in hand with the widening of the domain of inquiry has gone on, also, the invention of more refined apparatus of research, and the increase of ingenious methods for bringing knowledge into new combinations to ascertain and express means and averages. With respect to the last point, it is gratifying to note that more than one anthropologist has realized the fact that any expression of means which does not also preserve the exact status of each component is faulty.

There is one element of true scientific investigation which, under the pressure of circumstances, is being better systematized by anthropologists. It is the classification of the subjects with which they have to deal, according to the laws of evidence. If we may be permitted the use of the term, the knowledges which underlie their scientific speculations and deductions differ most widely, some resting on the testimony of a single individual who has destroyed the last vestige of evidence by which he could make good his word; other reasonings are based upon the preservation of material in such form and abundance, and with such authentication, as to put it within the power of any investigator to report experiments or examine methods. Surely conclusions based upon these two kinds of evidence would differ greatly in their breadth of base. If a report of progress in any science should not omit to call attention to improvements manifested in the methods of the investigator, much more should it mark growing tendencies to conform itself to rigid logic in its inferences.

## WORKS OF GENERAL IMPORTANCE.

The Academy of Natural Sciences in Philadelphia organized courses of scientific lectures during the year, and elected Dr. Daniel G. Brinton,

professor of ethnology and archæology. The subjects covered were Palæolithic Man; the Races of Men; the White Race; Civilization, its Origin and Elements, its Centers, its Stages, and its Goal; Art in stone, wood, bone, shell, metal, and clay; Textile art and decoration, and Mnemonic design.

The American Association for the Advancement of Science met at Ann Arbor, Mich. The section of anthropology, under the vice-presidency of Mr. William H. Dall, confined its discussions chiefly to those lines easily suggested by the environment, viz., the mound-builders, and the Dakota stock of Indians. The vice-presidential address was a studied discussion of the tribes of Alaska.

Volume VI of the Index-Catalogue of the Surgeon-General's Library appeared in 1885, with titles from Heastie to Inseldt. Works of value to anthropologists will be found catalogued under Heredity, Hermaphrodites, Hippocrates, Histology, Homicide, Humerus, Hypnotism, Idiots, Imagination, India, Indians, Infant, Infanticide, Insane and Insanity (157 closely printed pages), and Insects.

Pilling's Bibliography contains the titles in full, and in important cases, an abstract of everything that has been published upon the languages of North American aborigines. Six years of uninterrupted labor have been bestowed upon this colossal work. The index to the volume furnishes an excellent synonymy of tribal names.

The work of the Bureau of Ethnology of the Smithsonian Institution, included that done in the field by archæologists, ethnologists, and linguists, and the publication of the third annual report. The special papers will be referred to under the names of their contributors. The introduction, by Maj. J. W. Powell, the Director of the Bureau, is far more than a *résumé* of the labors of others. The paper on Omaha Sociology, by Mr. Dorsey, evoked the expression of the Director's opinions upon sociology among savages, a subject to which he has devoted much thought; and Mr. Dall's paper on Labretifery and Masks draws out a chapter on activital similarities, in which certain rules are laid down with reference to the origin of like inventions in different parts of the world.

The Smithsonian Annual Report for 1885 will contain two volumes, one relating to the work of the Institution, the second to the work of the National Museum, where the subject of Anthropology is organized as follows:

1. Arts and Industries. Mr. G. Brown Goode, assisted by Mr. R. T. Earle, on Fisheries; Captain Collins, on Navigation; Mr. William H. Holmes and A. Howard Clarke, on Keramics; Romyn Hitchcock, on Textiles and Foods.

2. Ethnology and Aboriginal Technology. Prof. Otis P. Mason.

3. Archæology. Dr. Charles Rau.

Anthropo-biology, Anatomy, and Anthropometry, are under the charge of the Army Medical Museum.

Art and mediæval armor find their resting place at present in the Corcoran Art Gallery.

In 1885 was organized in Washington the Woman's Anthropological Society, with Mrs. Tilly Stevenson as president, and Miss Sarah Scull as corresponding secretary. The object of this association is twofold—to conduct investigations to which the avenues are especially open to women, and to encourage the sex in the prosecution of scientific work.

The École d'Anthropologie, of Paris, carried through successfully during the year the following programme:

*Zoologic Anthropology.*—M. Mathias Duval. Anthropogeny and Embryology compared; study of the first phases of development.

*General Anthropology.*—Dr. Paul Topinard. Analytical study of racial characteristics; difference between races and peoples; evolution of races in time.

*Prehistoric Anthropology.*—M. de Mortillet. Les Temps photohistoriques.

*Ethnology.*—M. Dally. 1. Description of human races; their geographical distribution; races supposed to be pure, crosses of certain ethnic groups. 2. Sociology according to Compte & Spencer.

*Linguistic Anthropology.*—M. Hovelacque. Language in its relations to races and peoples.

*Medical Geography.*—M. Bordier. Influences of environment and in particular of social environment upon the production, progress, and spread of diseases.

*Complementary course.*—Zoologic Anthropology. M. Hervé. Parallelisms of anatomy between man and the higher animals. Comparative anatomy of the muscles and the viscera. Comparative and human teratology; monstrosities in general.

*Biologic Anthropology.*—M. Blanchard. General physiological resemblances between man and the animals.

Composite Photography is taking its place among the instruments of anthropology, in one case the handwriting having been subjected to its methods in order to arrive at the type or mean expression of each letter. In this case the purpose was to detect fraud. Dr. Neubauer has made an excellent study of the race types of the Jews, followed up by Mr. Jacobs with a similar investigation concerning the modern Jews. His composite photographs of Jewish lads will be examined with great interest.

A serious problem in deductive anthropology is a graphic method of illustration, which, while it exhibits means and averages, at the same time does not conceal individualities. Tables of means have long given dissatisfaction. Binomial curves are of great use up to three or four series, after that, colors must be used, the printing of which is expensive. It has been the practice with the author of this summary in showing the distribution of mounds, &c., to take a county or township map, and to put a dot or other plain symbol for each mound, heap, work, &c.

The result, of course, exhibits *in situ* the extent and density of each type. M. Manouvrier has improved on this in a paper read before the Paris Anthropological Society. His plan is to place across the top of the page the whole range of indices, each index number inclosed between two vertical lines. Down the left margin of the page may be written the names, races, &c., under consideration. Each measurement taken is indicated by a dot in the proper square. In the space with the name may occur the whole number of examples, while at the right extremity of the same line may be written the mean. This system is varied by M. Manouvrier by introducing horizontal lines of dots for squares and putting actual fractional parts for dots.

The Société Américaine de France has undertaken the composition of a dictionary of American archæology to be published in its name and under its auspices. A committee has been appointed to divide the work among the members of the society. The secretary of the committee will prepare the list of words for the dictionary. The committee consists of the following-named gentlemen: MM. Auben, Léon de Rosny, Malte Brun, Castaing, Remi, Simeon, and Peuvrier.

## ARCHÆOLOGY.

Mr. William H. Holmes had occasion during the year to examine the collections of mound-builders pottery in the Museum of the Davenport Academy. In paste, manipulation, and functions, this ware differs not in the least from that which has been frequently described as coming from the Mississippi Valley. The great merit of Mr. Holmes's work is the analysis and classification of form and the philosophic treatment of the subject of decoration.

An archæological experiment of the greatest value was made by Mr. Holmes. Noticing that very many fragments of ancient American pottery preserved marks of textiles he conceived the notion that a cast in fine sculptor's clay or plaster would restore the fabric. The methods and results of these experiments are given in the third annual report of the Bureau of Ethnology. It is highly important that these experiments should be followed up on pottery from different parts of the world. The same author has published a paper on the evidences of successive populations in the valley of the city of Mexico.

Dr. Abbott's publication in the American Naturalist on archæological frauds opens our eyes to the enormous amount of these practices. Aristotle's rule not to believe an archæologist unless he preserves the evidences of his assertions, will have to be rigorously applied, in order to subdue this pestilential element in a noble science.

The Rev. S. D. Peet has written a series of articles on the symbolism of the ancient Americans, his work being mainly directed to collating the many types used in mythic representations.

The American Journal of Archæology and History of Fine Arts was founded at the Johns Hopkins University under the editorship of Mr. A. S. Frothingham. The numbers which have appeared exhibit the policy of the journal to be of the exalted standard adopted by the other serial publications of the university.

The discussion of the question, who were the mound-builders? has received a fresh impetus from the ground taken by Major Powell and the Bureau of Ethnology that the so-called mound-builders were none others than the immediate ancestors of the Indians inhabiting the United States at the time of its first exploration. Mr. Cyrus Thomas has devoted several papers to the discussion of the subject.

A course of Archæology was endowed during the year in Lisbon under the patronage of Prince Charles, and in charge of M. da Silva. Prizes to the amount of $250 will be divided among the students.

*The Precursor of Man.*—M. Gabriel de Mortillet is the author of the theory that the flints of Thenay were the workmanship not of man at all but of his precursor, the anthropopithecus. The argument of this distinguished archæologist is somewhat as follows: The study of paleontology acquaints us with the succession of animals. We know that animals have varied from one epoch to another, and that these variations are the more profound as the epochs are removed in time. We know also that the higher the organism the more rapid have been the variations.

The mammals of the upper Tertiary are different from those of today. Man cannot have escaped this law. If evidences of workmanship exist in the Tertiary, they prove the existence not of man but of his precursor. 1. In Otta, Portugal, in the valley of the Tagus, at the base of the Pliocene, have been found worked flints. 2. Puy Courny, near Aurillac (Cantal), same horizon, has furnished silex both wrought and transported. 3. Thenay (Loir-et-Cher) reveals a being intelligent enough to soften flint by fire in order to make it more tractable, although the beds are older than those of Otta or Puy Courny, in fact they belong to the lower Miocene or the upper Eocene. M. Mortillet examines carefully the question of natural cleavage of flint, and decides that those of Thenay afford unmistakable evidences of anthropopithecan workmanship.

In reply to M. Mortillet several archæologists have taken the view that the so-called crackled and retouched flints of Thenay are not the products of human workmanship at all. On the other hand, M. de Quatrefages, admitting for argument sake the existence of wrought flints from the Tertiary, combats de Mortillet's theory of anthropopithecus, alleging that man could have lived in that period. "It may be true," says de Quatrefages, "that during the Tertiary and since mammalian fauna may have been renewed again and again, and that not one species belonging to that time survives, but the discoveries

made in the Quaternary gravels of Nerbaddah and Quadavéry lead us to suppose even this assertion exaggerated. The law governing mammalian existence does not apply to man. Independent of his animal nature man possesses an intelligence which enables him to contend successfully with nature, even when he is in the lowest condition of social and intellectual development. If man lived in the Tertiary he was certainly as able to defend himself against the deleterious influences resulting from geological changes as he is to-day, against the extremes of heat and cold." It also occurs to us that the pithecan ancestors of man had progressed further in the faculty of invention than have any modern apes. In other words, if Tertiary apes utilized fire and chipped flints, modern apes should also retain these arts.

In the Proceedings of the United States National Museum will be found a detailed description of the Chaclacayo trephined skull from a cemetery near Lima, Peru, which is the most remarkable case of post-mortem trephining reported. Eight distinct furrows were cut in order to remove the section, which is nearly 2½ inches in diameter.

## BIOLOGY.

Professor Cope, in his discussion of the origin of man and the other vertebrates, comes to the following conclusion: "An especial point of interest in the phylogeny of man has been brought to light in our North American beds. There are some things in the structure of man and his nearest relatives, the chimpanzee, orang, &c., that lead us to suspect that they have not descended directly from true monkeys, but that they have come from some extinct tribe of lemurs."

In reply to an editorial in Science (VI, 81) asserting that man is of those forms whose ancestry is unknown, Dr. Theodore Gill says, "I cannot but think that the data at hand are already abundant for an answer, and that we can allocate his systematic relationships as well as those of any other animal. It is difficult for me to understand how any one acquainted with the data could reach a conclusion other than that man is the derivative of a form very much like the chimpanzee and gorilla, and that, could his remote ancestors be seen, they would be placed not only in the same family, but in the same group with the African apes."

The pelvic index is the ratio of the transverse to the conjugate diameter of the pelvis brim expressed by integers. Dolichopellic signifies a pelvis, the conjugate diameter of which is longer than the transverse, or closely approaching it, above 95; platypellic, a pelvis in which the transverse diameter greatly exceeds the conjugate, below 90; mesatipellic, a pelvis in which the transverse diameter is not greatly in excess of the conjugate, between 90 and 95. To the thorough discussion of this characteristic Dr. Hennig devotes a monograph published in Archiv *für Anthropologie.*

Dr. Philippe Rey has made an investigation upon the weight of the cerebral lobes, and some of his conclusions will be of interest. Of the 347 subjects examined, 231 were men, 116 women. While the total weight of the right hemisphere predominates over that of the left, the left frontal is heavier than the right. The right occipital is slightly heavier than the left. The difference of weight for the entire anterior region between men and women amounts to 69.65 grains, which constitutes a large proportion of the general cerebral excess of weight in the male sex.

Dr. Lissauer has added the sagittal suture to the other portions of the human cranium which have been used in obtaining anthropological measures. The sagittal curve or Norma sagittalis is obtained by sawing the skull through the median line and observing the border of the cut within the sagittal suture. Dr. Lissauer, by means of a special craniograph, obtains the profile of the sagittal line on the anteroposterior median plane of the skull. Certain points are fixed on the periphery, and by comparing them among themselves and in relation to a central point located at the intersection of the vomer with the lower face of the sphenoid, he obtains angles by means of which he compares the relative value of the different segments, and also certain of these lines with the *horizontal*, extending from the point named to the external occipital protuberance. A new vocabulary is introduced which will add much to the complexity of craniometry. The ethnic results of the paper may be thus set forth:

- Loxodontes
  - Micrencranes ..... Bushmen. / Typical negroes.
  - Mesencranes
    - Forehead, flat ..... Australians.
    - Occiput, bulged ..... Negro children. / Kaffirs.
    - Occiput, flat ..... Mongols (part).
    - Occiput, bulged ..... Eskimos.
    - Parietals bulged ..... Malays. / Melanesians (part).
    - Front of palatal straight ..... Americans.
    - Nose elevated ..... Mediterraneans.
  - Macrencranes ..... Negro children. / Hottentot woman. / Malays. / Papuans. / Mongols.
- Orthiodontes
  - Loxoprosopes, cerebral sector, small ..... Americans.
  - Orthioprosopes " " large ..... Mongols. / Mediterraneans.

Dr. Herman Welcker, in Halle, has made a study of the capacity of the cranium in connection with the three diameters. He first examines carefully the methods employed for the curvature of the skull by different processes and materials. The tables appended to the investigation exhibit enormous variations in the results, as a few examples will show. The following table gives the people, the author, the number of crania examined, and the average contents in cubic centimeters.

This study of Dr. Welcker's is worthy the attention of all anthropologists:

| People. | Author. | Number of crania examined. | Average contents in cubic centimeters. |
|---|---|---|---|
| 1. Germans | Welcker | 30 | 1,460 |
| | Morton | | 1,475 |
| | Weisbach | 68 | 1,524 |
| | Lucae | 12 | 1,532 |
| | Davis | 8 | 1,664 |
| 2. Hindus | Welcker | 12 | 1,275 |
| | Morton | | 1,311 |
| | Flower | 22 | 1,313 |
| | Swaving | 11 | 1,343 |
| | Quatrefages | 14 | 1,460 |
| | Davis | 26 | 1,425 |
| 6. French | Schaaffhausen | 13 | 1,430 |
| | Roth | 9 | 1,473 |
| | Hudler | 56 | 1,475 |
| | Welcker | 13 | 1,492 |
| | Davis | 22 | 1,503 |
| | Broca | 124 | 1,558 |
| 7. Italians | Welcker | 6 | 1,443 |
| | Flower | 76 | 1,475 |
| | Schaaffhausen | 11 | 1,486 |
| | Weisbach | 39 | 1,507 |
| | Davis | 7 | 1,566 |
| 9. Russians | Schmidt | 7 | 1,390 |
| | Schaaffhausen | 30 | 1,395 |
| | Hudler | 5 | 1,403 |
| | Welcker | 14 | 1,416 |
| | Landzert | 40 | 1,471 |
| | Davis | 10 | 1,596 |
| 18. Turks | Schaaffhausen | 5 | 1,387 |
| | Weisbach | 37 | 1,462 |
| | Welcker | 8 | 1,467 |
| | Hudler | 5 | 1,474 |
| | Davis | 3 | 1,526 |
| | Broesike | 3 | 1,547 |
| 20. Chinese | Morton | | 1,344 |
| | Zuckerkandl | 11 | 1,402 |
| | Schaaffhausen | 31 | 1,407 |
| | Flower | 16 | 1,424 |
| | Schmidt | 13 | 1,451 |
| | Ecker | 4 | 1,452 |
| | Swaving | 26 | 1,452 |
| | Welcker | 14 | 1,457 |
| | Lucae | 6 | 1,482 |
| | Quatrefages | 24 | 1,511 |
| | Broca | 22 | 1,518 |
| | Broesike | 10 | 1,518 |
| | Davis | 17 | 1,556 |
| 28. Dyaks | Schaaffhausen | 5 | 1,359 |
| | Swaving | 8 | 1,372 |
| | Welcker | 9 | 1,404 |
| | Davis | 11 | 1,435 |
| | Schmidt | 7 | 1,472 |
| | Quatrefages | 11 | 1,530 |
| 29. Polynesians | Broesike | 8 | 1,339 |
| | Zuckerhandl | 13 | 1,358 |
| | Morton | | 1,360 |
| | Schaaffhausen | 15 | 1,387 |
| | Ecker | 10 | 1,415 |
| | Welcker | 18 | 1,443 |

| People. | Author. | Number of crania examined. | Average contents in cubic centimeters. |
|---|---|---|---|
| 29. Polynesians—Cont'd. | Broca | 54 | 1,460 |
| | Flower | 26 | 1,469 |
| | Davis | 100 | 1,525 |
| | Quatrefages | 39 | 1,549 |
| 30. Australians | Ecker | 7 | 1,208 |
| | Lucae | 4 | 1,217 |
| | Morton | | 1,229 |
| | Hudler | 7 | 1,235 |
| | Schaaffhausen | 19 | 1,247 |
| | Welcker | 5 | 1,294 |
| | Flower | 32 | 1,298 |
| | Davis | 12 | 1,319 |
| | Broca | 18 | 1,347 |
| | Zuckerkandl | 3 | 1,377 |
| 31. Papuans | Ecker | 3 | 1,215 |
| | Schaaffhausen | 8 | 1,274 |
| | Broesike | 3 | 1,353 |
| | Welcker | 20 | 1,373 |
| | Meyer | 54 | 1,398 |
| | Regalia | 48 | 1,427 |
| | Davis | 3 | 1,495 |
| 32. Negroes | Schaaffhausen | 27 | 1,288 |
| | Ecker | 53 | 1,295 |
| | Swaving | 14 | 1,309 |
| | Welcker | 19 | 1,328 |
| | Zuckerkandl | 4 | 1.339 |
| | Lucae | 5 | 1,344 |
| | Hudler | 8 | 1,352 |
| | Schmidt | 21 | 1,356 |
| | Morton | | 1,360 |
| | Flower | 26 | 1,388 |
| | Roth | 3 | 1,405 |
| | Kupffer | 3 | 1,405 |
| | Quatrefages | 85 | 1,410 |
| | Broca | 85 | 1,430 |
| | Davis | 12 | 1,443 |
| 35. Eskimo | Schaaffhausen | 7 | 1,391 |
| | Morton | | 1,410 |
| | Welcker | 11 | 1,468 |
| | Quatrefages | 13 | 1,522 |
| | Broca | 12 | 1,539 |
| | Davis | 13 | 1,542 |
| | Flower | 17 | 1,546 |

The next point which Mr. Welcker considers is the so-called *modulus* (found by adding the three diameters of the skull) and its relation to the cubature, in dolicocephalic, mesocephalic, brachycephalic crania.

Chapter III discusses the cubature of the skull as well as its height and width among different peoples. Six pages are devoted to a table of these three measures upon different races. The table of cubatures, on pages 106, 107, represents the different races arranged in the order of the contents of the skull.

Chapter IV is devoted to the cephalic index. Table IV, page 126, like the one just mentioned on page 106, exhibits in a graphic manner the various races according to the cephalic index. This table is introduced in order to exhibit the author's method of graphic illustration.

*Skull capacity by different nations (C. C. M.).*

| | Germans. | Celts, Romans, and Greeks. | Slaves. | Farther India people. | Semites and Hamites. | |
|---|---|---|---|---|---|---|
| 1200 | | | | | | 1200 |
| 10 | | | | | | 10 |
| 20 | | | | | | 20 |
| 30 | | | | | | 30 |
| 40 | | | | | | 40 |
| 50 | | | | | | 50 |
| 60 | | | | 5 Hindoo Rajputs .....1258 | 4 Abyssinians .....1258 | 60 |
| 70 | | | | 12 Hindoos of Bellari ... 1275 | | 70 |
| 80 | | | | 6 Bhils, Gols, Khols .....1276 | | 80 |
| 90 | | | | 18 Better Hindoos.....1285 | | 90 |
| 1300 | | | | | | 1300 |
| 10 | | | | 16 Hindoos (v. Schlgw.), Thakurs, Kahars, | | 10 |
| 20 | | | | Sikhs, &c .....1322 | 4 Jews from the "Field of | 20 |
| 30 | | | | 5 Gorkhas.....1326 | Blood" at Jerusalem.1322 | 30 |
| 40 | | | | 5 Singalese .....1331 | | 40 |
| 50 | | | | 9 Sudras .....1335 | 13 New Egyptians.....1343 | 50 |
| 60 | | | | | 23 Old Egyptians.....1347 | 60 |
| 70 | | | | 6 Hindoos and Bengalese 1361 | | 70 |
| 80 | | | | 14 Ziganis ..... 1364 | | 80 |
| 90 | | 23 Ancient Romans (II)...1387 | | 3 "High-caste" Hindoos 1369 | | 90 |
| 1400 | | | | 5 Hindoo Brâhmans.....1370 | 5 Kaybles .....1400 | 1400 |

*Skull capacity by different nations (C. C, M.)*

| | Germans. | Celts, Romans, and Greeks. | Slaves. | Farther India people. | Semites and Hamites. | |
|---|---|---|---|---|---|---|
| 1400 | | | | | | 1400 |
| | | 20 Ancient Romans (I)....1406 | 18 Little Russians .....1407 | | 14 Guanches.....1401 | |
| 10 | 15 Zuydersee Islanders...1414 | 10 Roumanians .....1408 | | | | 10 |
| | 17 .... do .. .....1423 | | | | | |
| 20 | 20 Swedes .....1426 | | | | | 20 |
| | 5 Swiss, Dissenters .....1427 | | | | | |
| 30 | 20 Thuringians ..... ....1432 | | | | | 30 |
| | 10 Danes and Norwegians.1432 | 13 Venetians.....1432 | | | | |
| 40 | 3 Icelanders .....1440 | | | | | 40 |
| | 4 Swiss .....1440 | | | | | |
| 50 | | 13 Irish .....1450 | | | 20 Jews .....1451 | 50 |
| | 60 Region of Halle .....1460 | 10 Neo Greeks.....1458 | | | | |
| 60 | 24 German-Austrians .... 1462 | 20 Italians (not Venetians)1460 | 38 Great Russians .....1461 | | | 60 |
| | 24 Schleswig-Holstein ....1467 | 7 Portuguese .....1467 | | | | |
| 70 | 14 Rhine Franks.....1476 | 11 Spaniards.....1472 | 18 Poles .....1472 | | | 70 |
| | 16 Hollanders .....1478 | | | | 15 Arabs .....1476 | |
| 80 | 15 Suabians.....1485 | | 6 Servians .....1485 | | | 80 |
| | 10 North Hollanders .....1485 | | 6 Ruthenians .....1485 | | | |
| 90 | | | 6 Slowaks.....1489 | | | 90 |
| | 11 Hanoverians .....1494 | 12 Ancient Greeks.....1494 | | | | |
| 1500 | | 28 French.....1498 | | | | 1500 |
| | 20 Hessians .....1503 | 12 Scotch .....1503 | 36 Czechs .....1506 | | | |
| 10 | | | | | | 10 |
| | 20 Breisgue .....1512 | | | | | |
| 20 | | | | | | 20 |
| | | | 8 Croats .....1525 | | | |
| 30 | 15 English .....1531 | | | | | 30 |
| 40 | 20 Ancient Bavarians ....1540 | | | | | 40 |
| | 12 Swiss of different cantons .....1543 | | | | | |
| 1550 | | | | | | 1550 |

*Skull capacity by different nations (C. C. M.)*—Continued.

| | Mongols. | Malays. | Papuans and Australians. | Negroes and Koi-Kois. | Americans. | |
|---|---|---|---|---|---|---|
| 1200 | | | | | 7 North Americans (artificially deformed)....1176 | 1200 |
| 10 | | | | | | 10 |
| 20 | | | | | | 20 |
| 30 | | | | | | 30 |
| 40 | | | | 10 Bushmen.....1240 | 10 Caribs.....1232 | 40 |
| 50 | | | | | | 50 |
| 60 | | | | | 23 Old Peruvians (deformed).....1265 | 60 |
| 70 | | 7 Nukuhivans.....1267 | | | | 70 |
| 80 | | | | | | 80 |
| 90 | | | | | | 90 |
| 1300 | | | | 6 Donkas.....1294<br>5 Negroes, E. Soudan....1294 | | 1300 |
| 10 | | | | 12 Ashantis.....1313 | | 10 |
| 20 | 13 Thibetans.....1322 | | 20 Australians.....1321 | 38 Negroes, different origins.....1320 | 5 Brazilians.....1322 | 20 |
| 30 | | | | 5 Maravi negroes.....1322 | 4 Peruvians (not deformed).....1335 | 30 |
| 40 | | | | 20 Kaffirs.....1336<br>7 Negroes, Lower Guinea 1340 | | 40 |
| 50 | | 5 Tahitans and Paumotans.....1350 | | | | 50 |
| 60 | 3 Burmans.....1352 | 4 Mendanoese.....1352 | | 7 Mozambique negroes..1359 | 8 Botocudos.....1359 | 60 |
| 70 | 11 Estens.....1371 | 23 Dyaks.....1373 | | 10 Hottentots.....1369 | | 70 |
| 80 | 8 Japanese.....1385 | 18 Bugis.....1379<br>14 Maoris.....1384<br>7 Sundanese.....1386 | 20 Papuans.....1372 | 5 Negroes, W. and Middle Soudan.....1387 | 6 Eskimos, Labrador....1378<br>6 Mexican Indians.....1379<br>4 Aymaras.....1384 | 80 |
| 90 | | 4 Nicobarese.....1387<br>10 Balinese.....1390 | | | | 90 |
| 1400 | 12 Lapps.....1400 | | | | | 1400 |

*Skull capacity by different nations (C. C. M.)*—Continued.

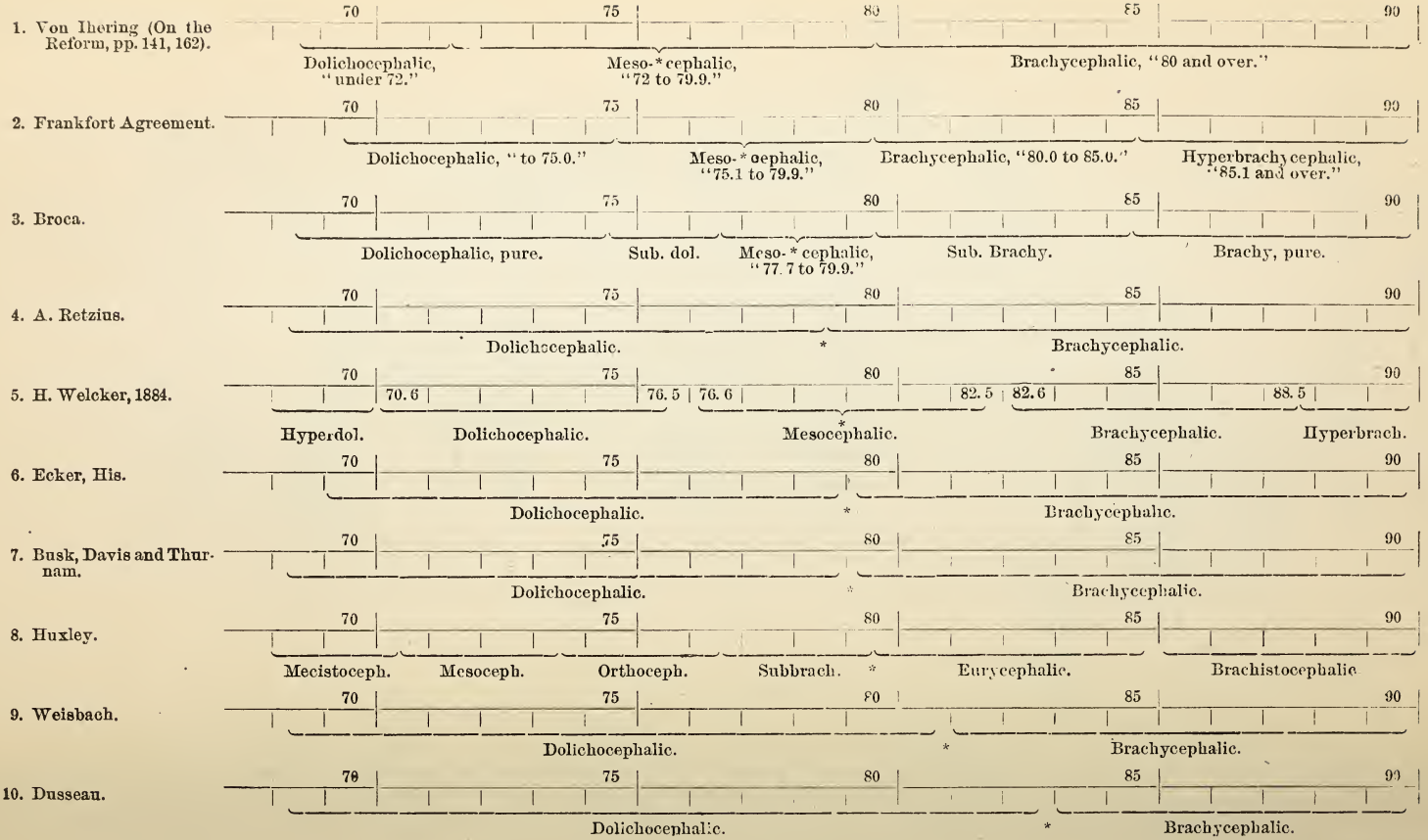
| | Mongols. | Malays. | Papuans and Australians. | Negroes and Koi-Kois. | Americans. | |
|---|---|---|---|---|---|---|
| 1400 | | | | | | 1400 |
| 10 | 5 Tunguese ..... 1410 | 19 Madurese ..... 1419 | | | 9 Araucanians and Patagonians ..... 1402 | 10 |
| 20 | | 20 Amboinese ..... 1421 | | | 11 Northwest Americans 1405 | |
| | | 15 Macassars ..... 1424 | | | 6 Puris and Quarapanas 1416 | 20 |
| 30 | 10 Tartars ..... 1432 | 2 Chatham Islanders .... 1425 | | | | |
| | | 7 Different Polynesians.. 1428 | | | | 30 |
| 40 | 6 Magyars ..... 1440 | 7 Ulie, Carolines ..... 1434 | | | 26 Indians of the United States ..... 1440 | 40 |
| | 12 Basques ..... 1440 | 37 Javanese ..... 1437 | | | | |
| 50 | 54 Chinese ..... 1444 | 9 Uahuga and Fatuah ... 1441 | | | | 50 |
| | 8 from the Kurgans of Sarepta ..... 1444 | 22 Sumatrans ..... 1455 | | | 29 Greenlanders ..... 1452 | |
| 60 | 23 Turks ..... 1452 | | 2 New Caledonians ..... 1463 | | | 60 |
| 70 | 17 Fins ..... 1464 | | | | | 70 |
| | 22 Kalmucks ..... 1466 | | | | | |
| 80 | 24 Siamese ..... 1471 | | | | | 80 |
| | | 14 Hawaiians ..... 1487 | | | | |
| 90 | 8 Burats ..... 1489 | | | | | 90 |
| 1500 | | | | | | 1500 |

*Width indices of the various nations.*—WELCKER.

| | L. B. | Mediterranean races. | Mongols. | Malays, Papuans, and Australians. | Negroes and Koi-Kois. | Americans. |
|---|---|---|---|---|---|---|
| Dolichocephalic | 70 | | | 70.6 Polynesians. | 70.9 Maravi negroes. | |
| | 71 | 71.3 Abyssinians.. | | 71.1 Caroline Islanders of Ulie. | 71.1 Koi-Koi .... | 71.7 Eskimo of Labrador. |
| | | 71.4 Hindoos of Bellary. | | | 71.1 Guinea negroes. | |
| | | | | | 71.8 Ashantees.. | |
| | 72 | | | 72 New Caledonians. | 72.3 Mean of 7 negro groups. | 72.2 Greenlanders. |
| | | | | | 72.3 Kaffirs ..... | |
| | | | | 72.7 Papuans of Mysore. | | |
| | 73 | | | 73.3 Australians. | 73.1 Negroes of Middle and West Soudan. | |
| | | 73.6 Modern Egyptians. | | | 73.5 Mozambique negroes. | |
| | | 73.9 mean of 7 Hindu groups. | | | | |
| | 74 | | | | | 74.3 Puris, Quarapavis (Brazilians). |
| | | | | | | 74.8 mean of the Brazilian Indians. |
| | 75 | 75.1 Bhils, Gols. Khols. | 75.3 Thibetans. | 75.9 Mean of Polynesians. | | |
| | | 75.4 Irish ..... | | | | |
| | 76 | 76.2 Ancient Romans. | | 76.4 Maoris, Nukuhivvi. | | |
| | | 76.3 Singalese ..... | | | | |
| | | 76.9 Arabs ..... | | | | |
| | 77 | 77.1 Ancient Egyptians and Greeks. | 77.1 Estans ... | 77.1 Tahitians .. | | 77.0 Botocudos. |
| | | 77.2 Swedes, 77.3 Spanish. | 77.5 Burmans . | 77.3 Oahuans and Fatuhiwans. | | |
| | | 77.7 Kabyles..... | | 77.4 Nicobars ... | | |
| | | | | 77.7 Dyaks..... | | |
| | 78 | 78.0 Dutch ..... | | | | 78.3 Mexican Indians. |
| | | 78.2 Guanches and Ziganis. | | | | |
| | | 78.3 Hindu Sudras | | | | 78.9 Indians of the U. S. |
| | | 78.6 Danes and Norwegians, 78.8 Scotch. | | | | |
| | | 78.9 English ..... | | | | |
| Mesocephalic. | 79 | 79.0 Portuguese... | 79.1 Chinese .. | 79.0 Balinese.... | | |
| | | 79.1 Zuyder Sea Islanders and Icelanders. | | 79.1 Amboinese . | | |
| | | 79.8 Low German. | 79.8 Tartars... | 79.7 Hawaiians.. | | |
| | 80 | 80.0 Modern Greeks | 80.2 Japanese. | | | 80.1 Araucanians and Patagonians. |
| | | 80.8 Gorkhas..... | 80.3 Finns .... | | | 80.1 Undeformed Peruvians. |
| | 81 | 81.3 Middle German. | 81.9 Magyars . | 81.3 Mean of Asiatic Malays. | | |
| | | 81.6 Servians, 81.7 Italians, 81.8 Jews, Little Russians. | | 81.8 Sumatrans, Macassars. | | 81.7 NW. Americans. |
| | | | | | | 81.7 Undeformed Caribs. |
| | 82 | 82.0 Great Russians. | | | | |
| | | | | 82 Bugis ..... | | |
| | | 82.1 Poles, 82.2 High German and French. | | 82.3 Javanese... | | |
| | | | | 82.9 Mendanoese | | |

*Width indices of the various nations*—Continued.

| | L. B. | Mediterranean races. | Mongols. | Malays, Papuans, and Australians. | Negroes and Koi-Kois. | Americans. |
|---|---|---|---|---|---|---|
| Brachycephalic. | 83 | 83.0 Ruthenians... | 83.0 Kalmucks, Basques. | | | |
| | | 83.3 Roumanians.. | 83.3 Turks.... | | | |
| | | ..... | 83.6 Tunguse . | | | |
| | 84 | 84.1 Slovaks..... | ..... | | | |
| | | 84.2 Czechs ..... | 84.3 Siamese .. | | | |
| | | ..... | ..... | 84.6 Sundanese.. | | |
| | 85 | 85.1 Croats..... | 85.1 Burjats... | | | |
| | | ..... | 85.5 Lapps.... | | | |
| | | ..... | ..... | 85.7 Madurese .. | | |
| | 86 | | | | | |
| | 87 | | | | | |
| | 88 | 88.3 From the Kurgans near Serepta. | ..... | ..... | | |
| | | ..... | ..... | ..... | | |
| | 89 and over | | | | | 96.7 Ancient Peruvians. 102.0 Deformed North Americans. |


1. Von Ihering (On the Reform, pp. 141, 162).
70
75
80
85
90
Dolichocephalic, "under 72."
Meso-*cephalic, "72 to 79.9."
Brachycephalic, "80 and over."
2. Frankfort Agreement.
70
75
80
85
90
Dolichocephalic, "to 75.0."
Meso-*cephalic, "75.1 to 79.9."
Brachycephalic, "80.0 to 85.0."
Hyperbrachycephalic, "85.1 and over."
3. Broca.
70
75
80
85
90
Dolichocephalic, pure.
Sub. dol.
Meso-*cephalic, "77.7 to 79.9."
Sub. Brachy.
Brachy, pure.
4. A. Retzius.
70
75
80
85
90
Dolichocephalic.
*
Brachycephalic.
5. H. Welcker, 1884.
70
70.6
75
76.5
76.6
80
82.5
82.6
85
88.5
90
Hyperdol.
Dolichocephalic.
Mesocephalic.
Brachycephalic.
Hyperbrach.
6. Ecker, His.
70
75
80
85
90
Dolichocephalic.
*
Brachycephalic.
7. Busk, Davis and Thurnam.
70
75
80
85
90
Dolichocephalic.
Brachycephalic.
8. Huxley.
70
75
80
85
90
Mecistoceph.
Mesoceph.
Orthoceph.
Subbrach.
*
Eurycephalic.
Brachistocephalic
9. Weisbach.
70
75
80
85
90
Dolichocephalic.
*
Brachycephalic.
10. Dusseau.
70
75
80
85
90
Dolichocephalic.
*
Brachycephalic.

Some experiments highly interesting to physiologists are reported in Mr. Francis Galton's vice-presidential address before the British Association. By using a very large number of family records some results regarding stature are made to appear. As with seeds so with men, "offspring did not tend to resemble their parent seed in size, but to be always more mediocre than they—to be smaller than the parents, if the parents were large; to be larger than the parents, if the parents were small." An analysis of the family records gives the numerical value of the regression towards mediocrity as from one to two thirds with unexpected coherence and precision.

The most remarkable production of the year in the field of biological anthropology is Dr. Paul Topinard's Éléments d'Anthropologie Générale, an octavo of 1157 pages, 229 figures, and 5 plates. The volume covers the history of anthropology, the discussion of the general principles, and a minute account of anthropological methods regarding the hair, color of eyes and hair and skin, height, the encephalon, the cranium, and closing with anthropometry upon the living. Only a few of Dr. Topinard's results can be appended. Taking the section of the hair or crinal index as a primary classific concept, he gives the table below:

1. Hair straight, section more or less round, scarce on the face and body: Yellow and red races of Asia and America.

2. Hair nappy or very spiral, section more or less elliptical: Negro races of Africa and Oceanica.

3. Hair more or less curled or wavy, oval in section: Eurhpean races, Australians, Nubians, &c.

The next concept is the nasal index, to which Dr. Topinard attaches great importance. Adding this to the color of the skin we have:

| | | | | |
|---|---|---|---|---|
| Leptorrhines. (living.) 69 and less. | White races. [Leucoid.] | Hyperleptorrhine. | | Anglo-Scandinavian (Kymri). |
| | | Leptorrhine (non aquiline). | | Celts. |
| | | Leptorrhine (aquiline). | | Semites. |
| Mesorrhines. (living.) 70 to 81·4. | Yellow races. [Xanthoid.] | Flat nose. | Leptorrhine (cranial). | Eskimo. |
| | | | Mesorrhine (cranial). | Yellow races of Asia. |
| | | Salient nose. | | Redskins. |
| Platyrrhines. (living.) 82 and above. | Black races. [Melanoid]. | Well formed nose. | | African negroes. |
| | | Nose coarse, with enormous alæ. | | Melanesians and Australians. |

The nasal index on the living is the ratio between the length of the nose from the root to the outer insertion of the septum and the width outside of the alæ.

The subject of color is further discussed in its relation to the eyes and hair and the races grouped as below:

Eyes, color:

1. Black and blackish, different shades.
2. Green.
3. Hazel.
4. Blue and clear of different shades, including clear gray.

Hair, color:

1. Absolutely black.
2. Dark brown.
3. Clear chestnut.
4. (*a*) Blonde, yellowish.
   (*b*) Blonde, reddish.
   (*c*) Blonde, ashy.
   (*d*) Blonde, clear.
5. Red.

Skin, color:

1. Absolutely black.
2. Brown, shaded with red.
3. Brown, yellowish or olive.
4. Reddish.
5. Yellow or olive.
6. Yellowish white.
7. Brown white.
8. (*a*) Rosy white.
   (*b*) Florid white.
9. Freckled.

By color:

- White (Leucoid):
  - Blondes, Anglo-Scandinavians or Kymri.
  - Chestnut, Celto-Slavs.
  - Brunette, Mediterraneans and Semites.
  - Reddish (ruddy), one of the two Finnish types.
- Yellow:
  - Yellow proper, races of Asia and Eskimo.
  - Red:
    - Red proper, Redskins and Caribs.
    - Yellowish red, Guaranis, Botocudos.
    - Olive red, Peruvians.
  - Blackish, Charuas (Uruguay), Anct. Cal., So. Dravidas.
- Black:
  - Yellowish, Hottentots.
  - Reddish, African Negroes.
  - Blacks proper, Australians, Blacks of India, Tasmanians, and Papuans, Negritos, African Negroes.

The cephalic index is the ratio of the greatest skull width divided by the greatest skull length. As to the boundaries of the terms applied to these ratios, most unhappily the doctors disagree. Dr. Topinard's table is as follows:

*Dolichocéphaly* (74 per cent. and less):

·64 and less. Ultradolichocephaly
·65—·69. Dolichocephaly.
·70—·749. Subdolichocephaly.

*Mésaticéphaly*(75 to 79.9 per cent.):

·75, ·76. Sub———.
·77 Medium.
·78, ·799. Super.

*Brachycéphaly* (80 per cent. and over):

·80 to ·84. Sub ———.
·85 to ·89. Super.
·90 and over. Ultra.

The application of the cranial index to the divisions of the human species, previously considered, results as follows:

- I. White races.
  - Dólicho. — Anglo-Scandinavians, Franks, and Germans. Finns of one type, Mediterraneans.
  - Mésati. — Semites, Berbers, Egyptians.
  - Bráchy. — Celto-Slavs, Ligurians, Lapps.
- II. Yellow races.
  - Dólicho. — Eskimo, ancient Tehuelches, some Americans, Santa Barbara, Micronesia here and there; in Asia here and there, Melanesians.
  - Mésati. — Polynesians.
  - Bráchy. — American type, Alaska, Siberia, Mongols, Mantchoos, Indo-Chinese, Dravidians, Thibetans, Malay.
- III. Black races.
  - Dólicho. — Australians, Veddahs and congeners, typical Melanesians, African Negroes, Bushmen.
  - Mésati. — Tasmanians, Mandingos, Haoussas.
  - Bráchy. — Negritos of Malaysia and the Andamans.

It will readily be seen that the cranial index in its three branches applies to each of the three divisions of humanity [subspecies?], the significance of which seems to be that the tendency to pass from one to

the other belongs to the whole species rather than to any of its three divisions.

In this *résumé* we shall have space to mention but one other characteristic, stature:

*Nomenclature of stature.*

| Statue. | Men. | Women. |
|---|---|---|
| Tall | 1m, 70 and above | 1m, 58 and above. |
| Ultramedium | 1m, 69 to 1m, 65 | 1m, 57—1m, 53. |
| Inframedium | 1m, 65—1m, 60 | 1m, 52—1m, 40. |
| Short | 1m, 60—below | 1m, 39—below. |

Combining this mark with all previously mentioned, Dr. Topinard groups the races studied as follows:

| Vivo-nasal index. | Hair. | Cranial index. | Skin color. | Height. | Races. |
|---|---|---|---|---|---|
| White subspecies, Leptorrhine. | Wavy (oval section). | Dolichocephalic. | Blonde | Tall | Anglo-Scandinavians. |
| | | | Ruddy | do | Finns, type I. |
| | | | Brown | Short (relative). | Mediterraneans. |
| | | Mesaticephalic | do | do | Semites, Egyptians. |
| | | Brachycephalic. | do | Short | Lapps, Ligurians. |
| | | Dolichocephalic. | Chestnut | Medium | Celto-Slavs. |
| | | | Yellow | Short | Eskimo. |
| | | | Reddish | Tall | Tehuelches. |
| Yellow subspecies, Mesorrhine. | Coarse, straight round section, long on the head, body glabrous. | Mesaticephalic (.76.) | do | do | Polynesians. |
| | | Brachycephalic. | do | do | Redskins. |
| | | | Yellow | Short | Yellow race (of Asia). |
| | | | Yellowish | Medium | Guaranis. |
| | | | Olivish | Short | Peruvians. |
| | Bushy (oval section). | Dolichocephalic. | Black | Tall | Australians. |
| Black subspecies, Platyrrhine. | Woolly (elliptical section). | Dolichocephalic. | Yellowish | Very short | Bushmen (steatopygians.) |
| | | | Black | Tall | Melanesians (eyebrow salient, nose deep at the root). |
| | | | Black | do | African negroes. |
| | | Mesaticephalic | do | Medium | Tasmanians. |
| | | Brachycephalic | do | Short | Negritos. |

## COMPARATIVE PSYCHOLOGY.

Prof. Alexander Bain read a paper at the Aberdeen meeting of the British Association on the scope of anthropology and its relation to the science of mind. The whole burden of the essay was to insist upon amenability to measurements as the password of any set of human phenomena to the section of anthropology. This is as it should be. Mr. Bain further pointed out a great variety of mind actions which were already under the instrument of precision, and others which ought to be and could be. "Psychology has now a very large area of neutral information. It possesses materials gathered by the same methods of rigorous observation and induction that are followed in the other sciences. If these researches are persisted in they will go still further

into the heart of psychology as a science; and the true course will be to welcome all the new experiments for determining mental facts with precision, and to treat psychology as an acknowledged member of the section. To this subdivision will then be brought the researches into the brain, and nerves that deal with mental function; the experiments on the senses having reference to our sensations; the whole of the present mathematics of man, bodily and mental; the still more advanced inquiries relating to our intelligence; and the nature of emotion as illustrated by expression."

*Instinct.*—Mr. Romanes, in an address delivered before the Royal Institution in 1884, and published in their proceedings for 1885, thus defines instinct: "It is the name given to those faculties of mind which are concerned in consciously adaptive action prior to individual experience without necessary knowledge of the relation between the means employed and the ends attained, but similarly performed under similar and frequently recurring circumstances by all individuals of the same species." The origin of instinct, according to the same author, is twofold: it is produced by lapsing intelligence or by natural selection. The former is thus explained: "Just as in the lifetime of an individual, adjustive actions, which were originally intelligent, may by frequent repetition become automatic, so in the lifetime of the species, actions originally intelligent may by frequent repetition and heredity so write their effects on the nervous system that the latter is prepared, even before individual experience, to perform adjustive actions mechanically, which in previous generations were performed intelligently." For the following reasons many instincts are referred to natural selection solely: 1. Considering the great importance of instincts to species they must be in large part subject to natural selection. 2. Many instinctive actions are performed by animals too low in the scale to admit of our supposing that the adjustments which are now intuitive can ever have been intelligent. 3. Among higher animals intuitive actions are performed at an age before intelligence, or the power of learning by individual experience, has begun to assert itself. 4. Many instincts, like incubation, are of a kind which could never have arisen by intelligent observations." Finally, these two causes have coöperated in the formation of instincts.

The distance between intellection and volition on the one hand and the organic processes associated with them seem to be narrowing year by year. Dr. Horsely, in a lecture before the Royal Institution of Great Britain on the motor centers of the brain and the mechanism of the will, omitting the discussion of the existence of the freedom of the will and the sources of our consciousness of voluntary power, arrives at the following conclusions:

As a rule, both cerebral hemispheres are engaged at once in receiving and considering one idea. Under no circumstances can two ideas either be considered or acted upon attentively at the same moment. Therefore

the brain is a single instrument. Our idea of our being single individuals is due entirely to this single action of the brain.

The lecturer also pointed out the specific portions of the brain to which physiologists have been able to relegate certain activities.

Prof. Balfour Stewart delivered the annual address before the Society of Psychical Research, in London, August 24, on the occasion of the third anniversary. The exact position of the society is best indicated by the language of Professor Stewart: "To my mind the evidence already adduced is such as to render highly probable the occasional presence amongst us of something which we may call thought-transference, or, more generally, telepathy; but it is surely our duty as a society to accumulate evidence until the existence of such a power cannot be controverted. We have not been remiss in this respect, and it will be found from the pages of our proceedings that the main strength of our society has been given to prove the existence of telepathy, in the belief that such a fact, well established, will not only possess an independent value of its own, but will serve as an admirable basis for further operations."

In a paper on comparative physiology and psychology, published in the American Naturalist, Dr. Clevenger takes the ground that the science of psychology is based upon comparative microscopic anatomy and a physiology into which molecular physics shall enter more in the future. Not only are the laws which bind the social organism similar to and derived from those which govern the units of which it is composed, but the protoplasmic units are governed by the same processes down to chemical affinities.

Mr. Charles Morris contributes to the same journal a series of articles upon mind and matter, in which the limits of the boundaries of consciousness and unconsciousness are discussed.

## ETHNOLOGY.

The classification of mankind by blood is ethnology. Professor Flower's presidential address before the Anthropological Institute on January 27 was devoted to this subject. The majority of anthropologists at the close of 1885 leaned towards the theory of the unity of our species. Humanity, according to this view, is included in a single genus (Homo), which contains but one species (Sapiens). Here the consensus ends, but there still remains a tolerably fixed belief that this species contains three subspecies, main varieties or something of that kind. "After a perfectly independent study of the subject," says Professor Flower, "extending over many years, I cannot resist the conclusion, so often arrived at by various anthropologists, and so often abandoned for some more complex system, that the primitive man, whatever he may have been, has in the course of ages divaricated into three extreme types, represented by the Caucasian of Europe, the Mongolian of Asia,

and the Ethiopian of Africa, and that all existing individuals of the species can be arranged around these types or somewhere or other between them."

The Ethiopian or Negroid race, may be divided as follows:

*A.* Africans or typical Negroes.
*B.* Hottentots and Bushmen.
*C.* Oceanic negroes or Melanesians.
*D.* Negritos.

The Mongolian type:

*A.* Eskimo.
*B.* Typical Mongolian races of Asia.
*C.* The Malay.
*D.* Brown Polynesians.
*E.* American Indians.

The Caucasian or white division includes:

*A.* Xanthochroi.
*B.* Melanochroi.

The Dravidians of India, The Veddahs of Ceylon, and probably the Ainos of Japan and the Maoutze of China belong to this race, which may have contributed something to the mixed character of some tribes of Indo-China and the Polynesian Islands, and given at least the characters of the hair to the otherwise Negroid inhabitants of Australia.

Modern Jews are thus tabulated by Mr. Joseph Jacobs:

| | Country. | Number. | Per cent. |
|---|---|---|---|
| *A.* Jews by religion and birth: | | | |
| Ashkenazim | Teutonia, Slavonia | 6,500,000 | 92·8 |
| Sephardum | Romance, Levant, Africa. | 425,000 | 6·1 |
| Samaritans | Nablus | 150 | ..... |
| *B.* Jews by religion, not birth | | (75,000) | 1·1 |
| Falashas | Abyssinia | 50,000 | ..... |
| Karaites | Crimea | 6,000 | ..... |
| Daggatoum | Sahara | 10,000 | ..... |
| Beni Israel | Bombay | 6,500 | ..... |
| Cochin | Cochin | 1,600 | ..... |
| *C.* Jews by birth, not religion | | (12,000) | 0·2 |
| Chuetar or Anussim | Balearic | 6,000 | ..... |
| Maimines | Salonichi | 4,000 | ..... |
| G'did al Islam | Khorassan | 2,000 | ..... |

The recent troubles in Bulgaria have evoked a number of volumes treating upon the ethnology of the peoples more or less intimately engaged in the controversy. The works of Lewis Leger, Dr. Kanitz, and Leon Prunel de Rosny may be consulted with profit.

Professor Packard brings together in two articles, published in the American Naturalist, a great deal of interesting information respecting the former southward range of the Eskimo in Labrador. Dr. Franz Boas has in several communications made us well acquainted with his

residence among the Eskimos of Baffinland. Mr. Lucien Turner will soon publish an exhaustive monograph upon the Eskimo and Indian populations of Ungava, a region about which little has hitherto been known. Add to these Schwatka's travels, Lieutenant Ray's report on Point Barrow, Lieutenant Stoney's brief report on the Kowak, Murdoch's papers on arts at Point Barrow, Dr. Dall's address on the tribes of Alaska, and we shall have for this year a tolerably comprehensive review of the Eskimo area.

The following is Dr. Dall's outline of the tribes as at present recognized:

*Orarians.*

INNUIT STOCK.

| | Estimated population. |
|---|---|
| Northwestern Innuit: | |
| Kopăg-mūt, 1877 | ——— |
| Kāng-mālig'mūt, 1877 | 9,100? |
| Nūwūk-mūt, 1877 | |
| Nūwātŏg-mūt, 1877 | |
| Kū-ăg'mūt, 1877 | |
| Asiatic Innuit: | |
| Yuit | ——— |
| Island Innuit: | |
| Imāh-kli-mūt | ——— |
| Ing-ŭh-kli-mūt | 40? |
| Shi-wo-kŭg-mūt | 150? |
| Western Innuit: | |
| Kāviăg'-mūt, 1877 | 14,500? |
| Măh'-le-mūt, 1877 | |
| Un-ālig'-mūt, 1877 | |
| Skŏg'-mūt, 1877 | |
| Mag'emūt | |
| Kai-ā-lig-mūt | |
| Kŭskwŏg'-mūt | |
| Nūshāgag'-mūt, 1877 | |
| Oglemūt | |
| Kăniăg'-mūt | |
| Chū-gach'igmūt | |
| Aleutians: | |
| Unŭngŭn, 1877 | 2,200? |

*Indians.*

TINNEH OR ATHABASCAN STOCK.

| | |
|---|---|
| Western Tinneh: | |
| Kai'-yūh-kho-tā'nā, 1877 | 2,000? |
| Ko-yū'-kŭkh-o-tā'-nā, 1877 | |
| Un'-ā-kho-tā'-na, 1877 | |

| | |
|---|---|
| Kutchin tribes: | |
| Ten′-an-kŭt-chin′, 1877 | 700? |
| Tennŭth′-kŭt-chin′, 1877 | Extinct. |
| Tăt-sah′-kŭt-chin′, 1877 | Extinct. |
| Kŭt-chā-kŭt-chin′, 1877 | ——— |
| Nahsit′-kŭt-chin, 1877 | ——— |
| Vŭntā′-kŭt-chin′, 1877 | ——— |
| Hai-ăn-kut-chin (?), 1877 | ——— |
| Eastern Tinneh: | |
| K'nai′-ā-kho-tana | 614 |
| Ah-tenā′, 1877 | 250 |
| Nehaunees: | |
| Abbā-to-tenāh, 1877 | ——— |
| Acheto-tinneh, 1877 | |
| Khŭn-ŭm-āh′ | ——— |
| Carriers: | |
| "Takŭlli" | ——— |
| T'silkotinneh | |
| Tlinket or Kalashian stock: | |
| Chilkaht-kwan | 1,314 |
| Yăk-ū-tăt′, 1877 | 500? |
| Sit-ka-kwan, 1877 | 4,949 |
| Stakhin-kwan, 1877 | |
| Skŭt-kwan (?) Dawson, 1844 | |
| Haida stock: | |
| Haida | 788 |
| Tsimp-si-an′ stock: | |
| Tsimpi-si-an′ | ——— |

*Ethnography of Guatemala.*—Dr. Otto Stoll, a resident physician in Guatemala, has undertaken to supplement the work of Brasseur and of Berendt on the comparative linguistics of the Central American States. There are eighteen languages now spoken in Guatemala, fourteen of them belonging to the Maya Qu'iché, viz, Maya, Mopan, Chol, Qu'ekchi, Pakonchi, Uspanteca, Ixil. Dr. Stoll divides the Maya in four groups:

*A.* Tzental.
*B.* Pokonchi.
*C.* Qu'iché.
*D.* Mame.

*A. Tzental group.*

1. Chontals of Tabasco.
   Synonymy: Do not confound them with the "Chontales" of Nicaragua, who are entirely different.
2. Tzentalis (Ocosingo).
   Synonymy: Celdal (Cespeda).

3. Tzotziles (San Christobal de Chiapas).
   Synonymy: Cinacanteca (Cespeda); Zotzlem (Brasseur) or Zotzil; Quelenes (Spanish historians).
4. Chañabal (Comitan near north of Gautemala).
5. Choles (across Guatemala from Salinas r. to Montagua r.; see p. 90).
   Synonymy: Putum (Berendt); Cholti (Moran); Colchi (Palacio); Ecolchi (Alonzo de Escobar).
6. Mopanes (north of Chols in Gautemala).

*B. Poconchi group.*

1. Qu'ekchis (east, west, and north of Coban).
   Synonymy: Caechi (Palacio); Caichi (Juarros); Aquacateca, Mame, Qu'iché, Cakchiquel, Tzu'tuzil, Pokomam, Chorti. The Sinca, Pupulca, Pipil, and Carib represent other stocks.
   Dr. Stoll takes up his work in a very systematic manner, stock by stock, giving in each the tribes examined, together with the literature, synonymy, chirography, history, and vocabulary. Thus:

(*a.*) Aztec stock. The Pipils (Escuintla and Cuajiniquailapa).
   Synonymy: Pipil (authors); Mejicano and Nahuatl (Juarros); Nahuatl of the Balsam coast and Izalco (Squier); Mexicanic, or language of the Tlaskaltekas (Scherzer).

(*b*). Mije stock. The Pupulucas (Cognaco extreme southeast).
   Synonymy: Pupuluca (Juarros); Populuca (Palacio); Popoluca (Berendt Mss.). Papaluka (Brasseur) is the name of a Cakchichiquel village, and Scherzer's Pupuluka Katschike is pure Cakchiquel.

(*c.*) Carib stock. The Caribs (Gulf of Honduras).

(*d.*) The Maya-Qu'iché stock; 250 words in 16 languages given. Egkchi (Habel); Cakchi (Charencey); Vater confounds Cacchi with Qu'iché.

2. Pokonchis (around Tactic).
   Synonymy: Spelled Poconchi, Pocomchi, and Pakomchi. The Poconchi of Gage and Scherzer is Pokomam.
3. Pokomams (Guatemala to Jalapa and eastward).
   Synonomy: Poconchi (Gage and Scherzer); Pakome (Charenay)).
4. Chortis (Zacapa and Chequemula and eastward).
   Synomymy: Lenguaapay (Palacio); Chol (Jimenez, by Brasseur).

*C. Quiché group.*

1. Qu'ichés (Cunen and Rabinal, southwest to Pacific).
   Synonymy: Lengua Utatlica (authors); also Kiché.
2. Uspantaks (S. Miguel Uspantan).
3. Cakchiquels (Tecpan to Sta. Lucia and to Pacific).
   Synonomy: Lengua Achi (Fuentes, Palacio); Cuauhtemalteco? (Palacio); Kacchikil (Vater); Chacciquel (Th. Gage); Pupuluka Katschikel (Scherzer); also Cakchiquelchi.

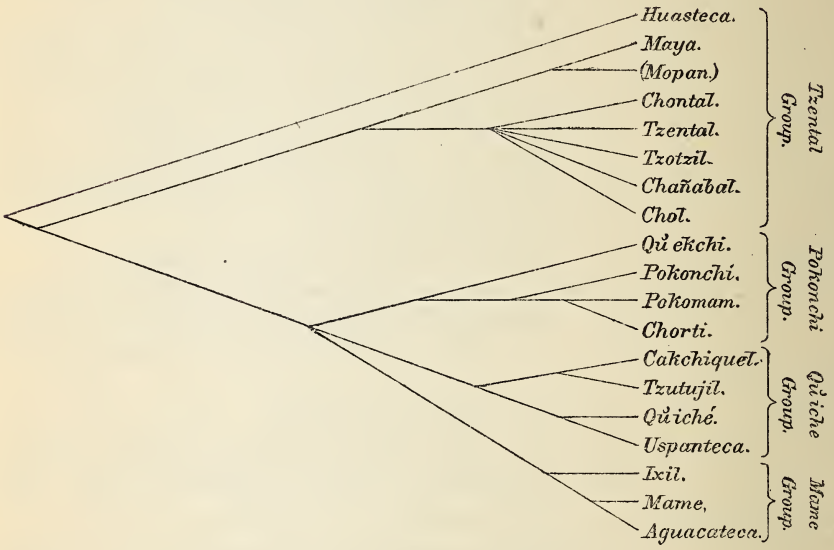
4. Tz'utujiles (around Aitlan).
   Synonymy: Sotojil (Fuentes); also Zutuhil, Tzutohil.

*D. Mame group.*

1. Ixiles (Cotzal and vicinity).
2. Mames (all Southwestern Guatemala).
   Synonomy: Zakloh-pakap (Reynoso); Mem. (authors).
3. Aguacatecas (Huehuetenango. The Sinca language (Southeast Guatemala).
   Synonomy: Sinca (Juarros); Xinca (Berendt Mss.); Xorti (Gavarrette's chart).

The Alagüilac language (S. Cristobal) little known.

*Scheme of the Maya languages.*




Dr. John Beddoe has published the result of a study extending over thirty years, prosecuted for the purpose of ascertaining the components in the present population of the British Isles. The color of the hair and eyes is the chief reliance in the author's observations for the analysis of racial distribution in the present population of Britain.

## GLOSSOLOGY.

The lecture before the "Conference Transformiste" this year was delivered by M. Abel Hovelacque on the evolution of language. According to the lecture both scientific analysis and the speech of infants prove that language primordially springs from monosyllabic elements. At first the cries and ejaculations of children are intentional, and later they in common with savages express their ideas by emotional tones.

From these rude beginnings language pursues a law of evolution which we may study quite apart from the people who use it, in the same manner and through the same methods as the zoologist studies comparative anatomy. M. Hovelacque relegates language to the class of physiological science, and studies it in its formation, growth, maturity and decay. Monosyllabism is the youth of language, agglutination characterizes its adolescence, flexion its manhood and decrepitude.

An ingenious example of linguistic criticism is that to which Dr. Brinton has subjected the Taensa grammar and dictionary of M. J. Parisot. After scrutinizing the structure of the grammar and examining the errors in climatic and other allusions in the text, Dr. Brinton comes to the conclusion that the whole thing is a forgery. After correspondence with Lucien Adam and F. Müller it seems more probable that the young author had really gotten hold of an ancient manuscript, but that he had so doctored it that he is ashamed to reveal the original. Meanwhile these savants have decided upon a most praiseworthy course, viz, to say nothing about the Taensa grammar until the author produces the original manuscript.

Dr. Daniel G. Brinton appealed to American students to devote themselves to our aboriginal languages, quoting in conclusion the words of Professor Whitney: "The study of American languages is the most fruitful and the most important branch of American archæology."

Philologists are frequently at a loss to see how collectors of vocabularies can have listened so differently to the pronunciation of words of savages. Much of the difference in their vocabularies is doubtless due to a want of uniformity in alphabet and to the nationality of the transcriber. More subtle than either of these causes is that pointed out by Mr. Hale, namely, the existence of elementary sounds of an intermediate character which seem to float between two, and sometimes even three or four, divers articulations.

The linguistic stocks of all the tribes of North America are gradually being worked out by the Bureau of Ethnology. The strip of west coast from Alaska to Mexico, crowded with different languages, is the last to yield to classification. Mr. Dorsey has succeeded in unraveling the little bands on the Siletz Agency with the following result:

*Athapascan or Tinné family.*—South River; Chetcoe dialect of the Tutu; Joshua and cognate dialects of the Lower Rogue River Indians; Naltunnetunns; Mekwunutunns; Yukwitee or Euchre dialect; Kwatami or Sixes; Upper Coquille; Applegate Creek; Galice Creek; Chasta Costa (Shista Khwu-sta).

*Siuslaw.*—Siūslaw; Umpqua; Alsea; Yaquina.

*Mulluk.*—Lower Coquille.

*Takelma.*—Upper Rogue River.

*Sasti.*—Shasta.

*Klikitat.*

## COMPARATIVE TECHNOLOGY.

In several quarters a fresh impulse has been given to the intimate study of modern savage technique.

The fact that we have no other clue to the industrial history of the past or to the explanation of the discoveries of the archæologist ought to have directed attention sooner to the necessity of describing savage processes down to the minutial.

Dr. Washington Mathews, in his paper on Navajo weaving, has produced a paper of this class worthy of imitation. Its highest commendation is that any modern weaver could from the description reconstruct the apparatus and produce a Navajo blanket or belt.

Col. F. A. Seeley, of the United States Patent Office, has published a second paper on the genesis of inventions from the standpoint of the patent examiner. A convenient term, *eurematies*, is used to define the study of inventions as to their order and their laws.

Prof. Cyrus Thomas publishes in the third report of the Bureau of Ethnology an elaborate examination of the "Tableau des Bacabs," Codex Cortesianus, and plate 44, Fejervary Codex, to show the intimate relation between the Maya and the Mexican symbols and calendars in their method of representation.

Dr. Brinton's paper on the lineal measures of the semi-civilized nations of Mexico and Central America reaches the following conclusions:

1. In the Maya system of lineal measures, foot, hand, and body measures were nearly equally prominent, but the foot-unit was the customary standard.

2. In the Cakchiquel system hand and body measures were almost exclusively used, and of these those of the hand prevailed.

3. In the Aztec system body measurements were unimportant, hand and arm measures held a secondary position, while the foot measure was adopted as the official and obligatory standard both in commerce and architecture.

4. The Aztec terms for their lineal standard being apparently of Maya origin suggests that their standard was derived from that nation.

5. Neither of the three nations was acquainted with a system of estimation by weight, nor with the use of the plumb-line, nor with an accurate measure of long distances.

## SOCIOLOGY.

As a means of realizing a vast amount of material for sociological purposes, the only safe method in such investigations, Dr. Francis Galton has made use of family records, printed questions put in the hands of great numbers of people to be filled up. The results of this inquiry are partially summed up in the vice-presidential address before the section of anthropology in the British Association with the title "Types and their Inheritance." Especial attention is given to stature, for rea-

sons stated in the address. It appears that the offspring does not tend to resemble the parents, but to be always more mediocre than they; to be smaller if the parents were large, to be larger than the parents if the latter were small.

"There can be no doubt," says Mr. Galton, "that heredity proceeds to a considerable extent, perhaps principally, in a piecemeal or piebald fashion, causing the person of the child to be to that extent a mosaic of independent ancestral heritages, one part coming with more or less variation from this progenitor and another from that. To express this aspect of inheritance where particle proceeds from particle, we may conveniently describe it as particulate."

"Whenever a feature in a child was not personally possessed by either parent, but transmitted through one of them from a more distant progenitor, the element whence that feature was developed must have existed in a particulate, though a personal and latent form in the body of the parent. The total heritage of that parent will have included a greater variety of material than was utilized in the formation of his own personal structure." The lecture closes with the application of the argument to the formation of colonies or composite individuals.

Mr. Dall, from his long Alaskan experience, made familiar with masks and labrets, has extended his study into other regions, and produced a work on the geographical distribution of these objects which is of great ethnical value. His speculations lead him to the conclusion that intimate relationship once existed between Oceanica and the western continent.

The Rev. J. Owen Dorsey was for many years among the Dakotan tribes, and became so conversant with their language and habits that he has been invited by the director of the Bureau of Ethnology to prepare an elaborate account of that stock. His monograph upon Omaha Sociology is the first of a series, which will terminate with grammars and vocabularies. Mr. Dorsey is by far the best equipped man in the world to treat this subject. The Omaha belong to the Dhegiha group of the Siouan family, the other member of the family being the Kwapa. In connection with this paper should be read Major Powell's report upon it in the introduction to his third annual report.

Mr. Ward read before the Anthropological Society of Washington a paper of great sociological importance, in which are contrasted moral and material progress. By the former, the author means the actual removal of social evils; by the latter, the discovery of principles and the invention of appliances calculated to remove them. The aim of the paper was to call attention to the fact that while material progress goes on by steady accretions, in which every step is permanent gain, moral progress takes place by a rhythmic action of which only the algebraic sum of its many fluxes and refluxes can be counted. Every age has possessed all the arts of the age that preceded it, and has added something to them, but the welfare of man does not advance by any such

method. Mr. Ward sees the reason for this in the fact that knowledge, ingenuity, skill, and industry, well-nigh omnipotent in the accomplishment of anything toward which they can be once fairly directed, have not been applied to moral end and directed to the attainment of social well-being.

## MYTHOLOGY AND FOLK-LORE.

A very important addition to the philosophy of animism is that of Mr. J. G. Frazer in his connection of burial customs with the primitive theory of the soul. The whole range of literature has been consulted, and the scrupulous habit of Mr. Frazer in the enumeration of authorities will be of the greatest advantage to those who wish to follow up the subject. The feature most thoroughly examined is the identity of ghosts and the belief in a second or spirit self.

Major Powell, in reviewing Mr. Dall's paper on masks, draws attention to the fact that in paraphernalia, as in folk-lore, the practical passes imperceptibly into the mythical. "Savage mythology deals largely with animal life, and savage drama is intimately associated with savage mythology." Among many North American tribes the old men and women who transmit mythic lore are listened to with great interest, and as the stories of the ancient god-beasts are told, resort is had to dramatic personification to give zest and vigor to the mythic tales.

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# PAPERS RELATING TO ANTHROPOLOGY.

## OBSERVATIONS ON STONE-CHIPPING.*

By GEORGE ERCOL SELLERS, *of Bowlesville, Ill.*

When a boy, living among mechanics, artists, and artisans, preparing for the profession of civil and mechanical engineer, it was natural that I should be attracted to the studio with its adjoining workshop and taxidermic room of my mother's father, Charles Wilson Peale, and his sons. There was always something new to be learned there. He was a native of the province of Maryland, the son of one of the earliest Episcopal ministers who came from England and settled in that colony. He always took great interest in the history and incidents connected with the early settlement of Maryland and Virginia. He had a shelf in his library devoted to books and pamphlets relating thereto, many of which seemed to have been sent from Europe to him, for they bore inscriptions of "presented by," or "received from," my friend, Sir J. Banks or from Count Rumford, and others. Among them was a volume of autograph letters from his friend Thomas Jefferson on the same subject. This shelf was particularly attractive to me, for it always led to reminiscences of the most interesting character from my grandfather. On one occasion I came across on this library shelf a thin bound volume of letters of John Smith from the Virginia colony. It was a London publication, and (if my recollection is not at fault) comprised several pamphlets bound together. A passage in one of these letters, in describing an Indian he had met with, referred to the making of stone implements. I have not seen the publication since, and cannot after a lapse of more than sixty years quote from it, but will give the substance as impressed on my mind. He said in substance that the Indian carried with him a pouch filled with flakes of precious stones, and within his mantle, in a pocket made for the purpose, a small instrument made of bone or horn, that he *valued above all price* and would not part with, and with it he deftly shaped arrow-points and spear-heads from or out of the stone

* In the summer of 1885 Mr. Sellers visited Washington and called upon Dr. Rau, to whom he gave an account of his experiences in stone-chipping, but dwelling chiefly on what he had heard from Mr. Catlin concerning this subject. Dr. Rau, perceiving the importance of Mr. Sellers's remarks, induced him to prepare the present article. It will be seen that the Indians of this country resorted in stone-chipping to methods similar to those employed by the Mexicans, as related by Torquemada and Motolinia.

flakes. On calling my grandfather's attention to this, he said that although there was much truth in what at the time was written from the colonies, some things were highly colored and had to be sifted out or taken with caution, and he supposed the cutting of hard stone with bone or horn was one of these, and might be set down as one of Smith's yarns. I asked myself the question, What object could he have in inventing and telling it? There must be some foundation. At all events, it made an indelible impression on my mind.

Most of the arrow-points found within my reach in Philadelphia, Delaware, and Chester Counties, Pennsylvania, were chipped from massive quartz, from the opaque white to semi-transparent and occasionally transparent. Once, in company with my early preceptors, Jacob Pearce and Isaiah Lukens, both well-known scientists, on a mineralogical excursion, we came to a place where (judging from the quantities of flakes and chips) arrow-points had been made. After most diligent search only one perfect point was found, which is still in my possession, marked with ink "1818." There were many broken ones, showing the difficulty in working the material. Mr. Lukens collected a quantity of the best flakes to experiment with, and by the strokes of a light hammer roughed out one or two very rude imitations. No effort was made by pressure, which I cannot now understand, for at that time I was in the habit of breaking off points and trimming mineral specimens (likely to be injured by the jarring of a hammer stroke) by pressure with the hickory handle of my mineral hammer.

Maj. S. H. Long, afterwards colonel, who in the latter part of his life succeeded Col. John J. Abert as head of the Topographical Department of the United States Army, whenever in Philadelphia, was a frequent visitor at my father's house; and, when preparing for his expedition to the Rocky Mountains, in which my mother's youngest brother, Titian R. Peale, went as assistant naturalist, I saw him almost daily. The subject of flaking and forming arrow and spear-heads was one of frequent discussion. My grandfather, C. W. Peale, was at that time owner of the Philadelphia Museum, which had for that period a large collection of Indian curiosities, among them, many collected by Lewis and Clark on their northwestern expedition,—and to me the most interesting, was a box of stone implements in various stages of manufacture, evidently collected with the view of illustrating the process. They were never put on exhibition other than in the original package, the lid of the box only having been removed. Major Long's attention was called to these, and he expressed his belief that on his expedition he would learn the entire process, and on his return be able to explain everything in the Lewis and Clark collection.

The expedition returned, and, as far as I know, without any positive information as to the process of making the flakes. Mr. Peale said he had seen squaws chipping flakes into small arrow-points, holding the flake in their left hand, grasped between a piece of bent leather, and

chipping off small flakes by pressure, using a small pointed bone in the right hand for that purpose. From this it was evident that John Smith's story was no myth. In my life-long intimacy with Colonel Long the subject of the flaking operation has frequently been one of conversation, on my regretting that more attention had not been paid to it on either of his expeditions. Knowing his pre-eminence as a civil engineer and his high attainments as a mechanic, I thought more reliable information would have been obtained by him and his party, composed as it was of such prominent men of science. He said that flakes prepared for points and other implements seemed to be an object of trade or commerce among the Indian tribes that he came in contact with; that there were but few places where chert or quartzite was found of sufficient hardness and close and even grain to flake well, and at those places there were men very expert at flaking. He had understood that it was mostly done by pressure, and rarely by blows, but he had never witnessed the operation. He expressed his belief that it was an art fast being lost, for he had found among tribes who had never seen a white man since the advent of Lewis and Clark, wrought-iron arrow-points made in England by the Birmingham nailers, sent out as articles of trade by the fur companies, and that they were preferred to the stone points.

My early acquaintance with Catlin, the artist, was in the shop of Catlin, musical instrument and model maker, of Philadelphia. There I knew him as a very expert and superior workman in wood and ivory. As a portrait painter he was not at that time successful. He painted strong likenesses, but they lacked life-like coloring. A delegation of Indians on their way to Washington gave him an opportunity to paint the likeness of one of the chiefs. This was exhibited in the Pennsylvania Academy of Fine Arts, and from its novelty attracted much attention; in fact, it was so far a success as to bring him into notice. About this time I met him very frequently; his conversation always drifted on to the great value and importance of preserving correct likenesses of the Indians, whom he believed to be fast passing away. We all know how well he lived up to this idea, devoting his life to the work of producing the collection of Indian portraits now in the National Museum.

On Mr. Catlin's return from his long sojourn among the Indians, believing that, as an observing practical mechanic, nothing in the way of art among them would escape him, I took the first opportunity to see him. On my inquiry as to the mode in practice of splitting the stone into flakes for arrow and spear points, his reply was by a question characteristic of the man. He asked if I had forgotten Dr. Jones's axiom, "The least possible *momentum* is greater than the greatest possible *pressure*." This was in allusion to a lecture on mechanics we had together heard delivered by Dr. Thomas P. Jones (afterwards Commissioner of Patents). He then added, "That is well understood by the flake makers among the Indians, but it will soon be among the lost

arts, just as the nests of Birmingham brass battered-ware kettles, the Yankee tin-ware, and glass whisky bottles have already almost totally destroyed their crude art of pottery making. The rifle is taking the place of the bow and arrow. For boys' practice and for small game the iron points got from the fur traders are preferred to stone. A common jack-knife is worth to them more than all the flint knives and saws ever made."

After expressing himself in this manner he went on to explain what he had seen. He considered making flakes much more of an art than the shaping them into arrow or spear points, for a thorough knowledge of the nature of the stone to be flaked was essential, as a slight difference in its quality necessitated a totally different mode of treatment. The principal source of supply for what he termed home-made flakes was the coarse gravel bars of the rivers, where large pebbles are found; those most easily worked into flakes for small arrow-points were chalcedony, jasper, and agate. Most of the tribes had men who were expert at flaking, and who could decide at sight the best mode of working. Some of these pebbles would split into tolerably good flakes by quick and sharp blows striking on the same point; others would break by a cross fracture into two or more pieces; these were preferred, as good flakes could be split from their clean fractured surface by what Mr. Catlin called *impulsive pressure*, the tool used being a shaft or stick of between 2 and 3 inches diameter, varying in length from 30 inches to 4 feet, according to the manner of using them. These shafts were pointed with bone or buck-horn, inserted in the working end as represented in Fig. 1, bound with sinews, or rawhide thongs, to prevent splitting. For some kinds of work the bone or horn tips were scraped to a rather blunt point, others with a slightly rounded end of about one-half inch in diameter. He described various ways of holding the stone while the pressure was being applied. A water-worn pebble broken transversely was commonly held by being sufficiently imbedded in hard earth to prevent its slipping when held by the foot as the pressure was applied. Large blocks of obsidian or any easily flaked stones were held between the feet of the operator while sitting on the ground, the *impulsive pressure* being given to the tool grasped in both hands, a cross-piece on the upper end resting against his chest, the bone end against the stone in a slight indentation, previously prepared, to give the proper angle and to prevent slipping.

FIG. 1.

In some cases the stone operated on was secured between two pieces or strips of wood like the jaws of a vise, bound together by cords or thongs of rawhide; on these strips the operator would stand as he applied the pressure of his weight by impulse. The best flakes, outside of the home-made, were a subject of commerce,

and came from certain localities where the chert of the best quality was quarried in sheets or blocks, as it occurs in almost continuous seams in the intercalated limestones of the Coal Measures. These seams are mostly cracked or broken into blocks, that show the nature of the cross fracture, which is taken advantage of by the operators, who seemed to have reduced the art of flaking to almost an absolute science, with division of labor; one set of men being expert in quarrying and selecting the stone, others in preparing the blocks for the flaker. This was done when the blocks were nearly right-angled at the corners, by striking off the corner where the flaking was to commence, and, with a properly directed blow with a hard pebble stone, knock off of the upper edge a small flake, making a seat for the point of the flaking tool. Sometimes these blows were carried entirely across the front upper edge of the block, making a groove entirely across the edge, when the first row of flakes have been thrown off. It is the work of this operator to prepare seats for a second row, and so on. What was meant by almost absolute science was a knowledge and skill that would give the proper direction to the pressure to throw off the kind of flake required. Fig. 2 represents, as nearly as I recollect, the rude sketches made of the flaking tool used to throw off massive flakes, when a sudden percussive pressure was required in addition to the impulsive pressure the man could give. The staffs of these flaking tools were selected from young hard-wood saplings of vigorous growth. A lower branch was utilized, as shown at *a* in Fig. 2, to form the crotch in which the blow was struck. Another branch on the opposite side, *a'*, was used to secure a heavy stone to give weight and increase the pressure. When the stone to be flaked was firmly held, the point adjusted to give the pressure in the required direction, the staff firmly grasped, the upper end against the chest of the operator, he would throw his weight on it in successive thrusts, and if the flake did not fly off, a man standing opposite would simultaneously with the thrust give a sharp blow with a heavy club represented in cross-section *b* in Fig. 2, it being so shaped that its force is downward close in the crotch. It has been represented to me that a single blow rarely failed to throw off the flake, frequently the entire depth of the block of stone, sometimes as much as 10 or 12 inches. The tooth or tusk of the walrus was highly prized for tips of the flakers.

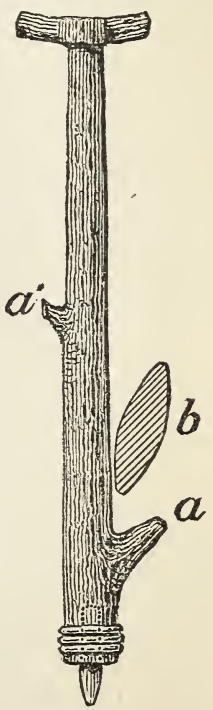


FIG. 2.

What I have thus far written is at second hand, being merely recollections of conversations at various times with the parties I have referred to, and more recently with a man who for over thirty years had been connected with a fur company, and who had lived most of that time among the Indians, and much of it, as a trapper.

What I now propose is to give some of my experimental practice in flaking and working flint (chert), and (from a purely mechanical standpoint) some conclusions drawn from a pretty extensive examination of the waste and refuse as well as finished and partly finished work left in the aboriginal flint workshops.

There are many places along the banks of the Ohio River and its tributaries that are not subject to the annual overflow, but are still below the occasional great floods, where the flaking process has been extensively carried on, and where cores and waste chips are abundant. At one of these places, on the Kentucky side of the river, I found a number of chert blocks, as when first brought from the quarry, from which no regular flakes had been split; some had a single corner broken off as a starting point. On the sharp, right-angled edge of several, I found the indentations left by small flakes, having been knocked off evidently by blows, as described by Catlin, as a preparation for seating the flaking tool. Most of the localities referred to are now under cultivation, but before being cleared of timber and subjected to the plow, no surface relics were found; but on the caving and wearing away of the river banks, as the light earth washed away, many spear and arrow-heads and other stone relics were left on shore. After the land had been cleared and the plow had loosened the soil, one of the great floods that occur at intervals of some fifteen or twenty years, would wash away the loose soil, leaving the great flint workshops exposed. It is from the stores of material left, the cores or nuclei thrown aside, caches of finished and unfinished implements and flakes, the tools and wastage, vast accumulations of splints, &c., that we can, on critical examination, draw tolerably correct ideas of the mode of working pursued.

One of these great flaking banks or workshops is exposed on the northern bank of the Saline River at its first rock "ripple," about 3 miles above its junction with the Ohio, the general course of the Saline being from the northwest to the southeast. Above the "ripple" the stream is only navigable during high water of the Ohio. On its southern side are ranges of hills from its mouth to its source, ranging between 300 feet and 400 feet in height, and on the divide between the west fork of the Saline and Eagle Creek they rise to a height of over 800 feet. The ridge is broken through by the valleys of small tributaries; the spurs from the ridge at places terminating in rock bluffs close to the river, at others leaving a narrow bottom. On the northern side of the stream the hills proper commence about 4 miles above the mouth, leaving a wider valley or bottom on that side; the low bottom lands of the Ohio extend nearly to the ripple, where commences what is termed the second bottom lands of the Ohio, which rise rather abruptly, extending with the river by its windings at varying distance from it. It is on this ridge where it is intersected by the Saline that the coal company made the terminus of their railroad and shipping port of coal.

On my first visit, in the fall of 1853, this was in dense forests with

the exception of a narrow strip along the bank of the Saline, which had been cleared for railroad coal dump, saw-mill, shops, and dwellings. The most of the cleared portion was a range of low sepulchral mounds crowded together. In cutting into them for foundations, small sized stone cists were exposed, none over 4 feet in length, with a single exception; this was (in excavating foundations for saw-mill boiler in the side of the largest of the mounds,) a skeleton at full length, surrounded by and covered with thin sandstone slabs, much as the small cists were formed. With this skeleton were found two small clay pots, some shell beads, a flint gun-lock, barrel, and metal trimmings of an old English musket, the stock so decayed that it fell to pieces when being taken out—no doubt a recent surface burial; in fact, human bones were found near the surface of all these mounds. The small cists over which they were originally raised contained nothing but fragments of bones, teeth, and occasionally a stone celt and a few flaked implements. The first indication of relics on what has proved to be a great stone implement manufactory was in sinking a cistern on the ridge about 200 yards from the river. This went through a mass of flint chips. By the year 1859 the little clearing around the house where the cistern was sunk had joined with the cleared strip on the river banks, making in all a clearing of some 25 acres. Heavy rains after the first plowing exposed some few specimens of spear and arrow points; the next plowing, a still greater number. But it was not until the great flood of the winter of 1862 and 1863 that overflowed this ridge some 3 or 4 feet, with a rapid current, that the portion under cultivation north of the mounds on the river bank was denuded, exposing over 6 acres of what at first appeared to be a mass of chips or stone rubbish; but amongst it were found many hammer stones, celts, grooved axes, cores, flakes, almost innumerable scrapers, and other implements, pieces of broken, much-decayed bone, but no perfect bone implements, many tines of the buck or stag, all of which bore evidence of having been scraped to a point. On exposure to the air they fell to pieces. Among this waste it was rare to find fragments of rude pottery, though they abound among the mounds near the river bank, and further north on the same ridge, where burnt sandstones, black earth full of fragments of shells and bone, show the site of a settlement—the field being nothing but a workshop. The great August flood of 1875, and the winter floods of 1881, 1882, and 1883 continued the work of denudation until the ground became unfit for cultivation, and was abandoned. The greatest number of cores, scattered flakes, finished and unfinished implements, are of the chert, from a depression in a ridge 3 miles to the south-east, where there is evidence of large quantities having been quarried. I have found a few cores of the white chert from Missouri. and the red and yellow jasper of Kentucky and Tennessee; but the flakes of these have mostly been found in nests or small caches, many of which have been exposed, and in every case the flakes they contained were more or less worked on their edges, whereas the flakes

from the neighborhood chert preserved their sharp edges as when split from the mass. These cache specimens with their worked serrated edges would, if found singly, be classed as saws or cutting implements. But here, where found in mass, evidently brought from a distance, to a place where harder chert of a much better character for cutting implements abound, they tell a different story. No two are exactly alike, yet the work on all is of the same character, and evidently done for the same object. To one discovering that object, they tell the story clearly, as well as the mode of working, written on stone, and better than it can now be told either by writing or illustrations.

To make myself understood I must have recourse to sketches, and then will most probably fail to make it as clear to the general reader as these stone flakes do to me. Let us first look at a flake as detached from the mass, and study its nature, presuming it to have been flaked from a stone that by a hammer stroke would break with a fine-grain conchoidal fracture. Fig. 3 is a plan view of the outer or high side

(Half size.)

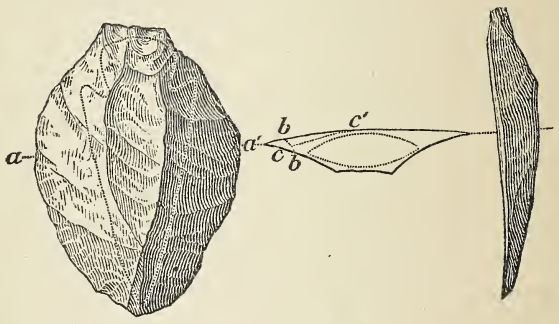



FIG. 3. FIG. 4. FIG. 5.

of an ordinary flake intended for a spear or arrow-head; the shape of this high side depending on the lines of fracture of the previous flaking. Fig. 4 is a section through the center of the flake on the dotted line *a a'*, showing its flat side and sharp edges. Fig. 5 an edge view, showing at its upper end the angle of the recess formed, and against which the point of the flaker had been pressed to throw off the flake; dotted lines in the cross-section Fig. 4 show the form of an arrow-head on the line *a a'* that the flake will work into. The form of the head is given by dotted lines in Fig. 3. From these it will be seen that the portion of the flake to be chipped away (and also the greatest portion of the chipping to be done) is from the flat side.

The man who makes the flake can at a glance see what it will best produce. His flakes are for transportation; bulk and weight are serious considerations. His practical eye tells him how to reduce them into the best merchantable form; and the greater number of the flakes found in the caches alluded to have been so worked, and always from the flat side of the flake. This could not be accidental. By referring to the axis line in section Fig. 4, the amount of chipping from the flat side that

has to be done will be seen. To attempt to do this and to throw off long chips from the sharp edge of the flake would prove a failure, as its sharp edge would either crumble away or it would cut and injure the point of the bone flaker without throwing off the desired chip or flake. Experience has taught the operator the best shape of edge to apply the pressure to accomplish his object, and it has also taught him how to reach it in the simplest possible way. A spoon-shaped hollow on the top of a flattened log, or even a gutter or groove cut in it, furnishes the means of holding the flake firmly, the raised or high side placed in the hollow, the flat side up; with the ends of the fingers of his left hand pressed on it he holds it firmly, while with his right hand a downward pressure is given by the flaking tool which breaks off chips with a fracture of about 45 degrees from the flat surface, leaving the edge in the best possible shape for future work, and that is the condition of these cache flakes as they are found.

In old times, before the invention and introduction of planing and shaping machines to work metals, the first and most important lesson taught to the machinist's apprentice was the use of the hand-hammer and cold-chisel. When an outer shell was to be removed from a metal casting and its surface left in condition to be finished by file or scraper, the smoothness and regularity of that surface was essential, not only for economy in working, but accuracy of the file finish. The apprentice was taught to hold his cold-chisel and so direct the strokes of his hammer that when a chip was started the chisel should hold to it, and not be allowed to cut too deep or slip and fly out, leaving a shape that is difficult to start a fresh cut without leaving ridges or cutting deeper, in either case causing additional labor for the finisher.

To a practical mechanic the examination of such a flint workshop as I have described—its waste chips to the partly worked flakes, the roughed out blocks, and the finished implements—reveal a line of workmanship so clear that it can be followed to the production of the same results.

The handling of the tool and flake to form an arrow-point is as much an act requiring exactness and precision as the handling the cold-chisel and hammer is to the machinist. The first chip thrown off is analogous to the first starting work of the cold-chisel; it is the text that must be adhered to to the end of the chapter. Holding the flake in such position that commencing at what is intended for the point of the intended work, the pressure with the flaking point is brought to bear close to the edge of the 45 degrees angle and at right angles to it; the result is a flake thrown off inclining towards the stem end of the arrow-point. In sectional sketch Fig. 4 from *a* to *a'* shows the 45 degrees angle left by the first rough shaping from *c* to *c'* the direction of the first chip thrown off. The seat left by this chip when thrown off is concave on the edge of the flake, the advance corner of which is the seating point for the tool to throw off the next chip, which does not entirely obliterate the concave of the first, and the following chip leaves a serrated edge, the chips or

flakes being generally parallel, which is the object of a good workman to make them. When the flat side by chipping has been reduced to nearly the required form, its edges are in the best possible shape for chipping the opposite or high side, then by alternate working from side to side the point is finished, either leaving it with serrated edges or by after delicate work throwing off the points, leaving a smooth, sharp edge. The indentations at the base either for barbs or for thongs to secure the point to its shaft are made by direct down pressure of a sharp point working alternately from side to side, the arrow-point being held firmly on its flat face. From the narrowness of the cuts in some of the specimens, and the thickness of the stone where they terminate, I have inclined to the belief that at the period they were made, the aborigines had something stronger than bone to operate with, as I have never been able to imitate some of their deep, heavy cuts with it; but I have succeeded by using a copper point, which possesses all the properties of the bone, in holding to its work without slipping and has the strength for direct thrust required. A soft iron or thoroughly annealed steel point answers even a better purpose. As yet no copper has been found on this flaking ground, though a few copper beads and remnants of what appear to have been ornaments have been taken from mounds on the ridges of the Saline, which I think is evidence that they had that metal at the earliest time work was done on this flaking bank.

Bryce Wright in his description of the Scandinavian knives or daggers refers to them as being most beautifully dentilled with parallel flaking and serrated edges. He says: "These knives or lances are true marvels of pre-historic art, and show an amount of skill and workmanship which cannot be imitated in the present age, the art of fashioning them having been entirely lost." Sir John Lubbock, on page 104 of "Prehistoric Times," says: "The crimping along the edge of the handle is very curious." As to parallel flakings with serrated edge, I have endeavored to show (from a mechanical stand-point) that the refuse of the great flint quarries points to a mode of working that must leave the dentilled markings parallel, and the edges worked from, serrated. What Lubbock speaks of as curious crimping on the edge of the handles is but the natural result of the mode of working I have examined these Scandinavian dagger handles, and find the same appearance on the blades of large-size broken piercers, numbers of which I have found among the rubbish, picked up, examined, and thrown away as imperfect specimens. Some of them have a spread, flat end or handle of over 1½ inch, with nearly square blades, evidently having been worked by down pressure from the edges corresponding to the spread end, these 45 degrees flakes meeting form angles and produce the square. The interlocking of the flakes at their meeting causes the crimped appearance, in some cases not unlike a row of beads, very beautiful, but not made with any such view, but simply the natural result of the mode of working.

Here also are found massive flakes or chips of fine-grained quartzite, that teach another lesson to a seeking practical mechanic, nosing about among the accumulated refuse. These flakes are often rough on one face, showing them to be an outside scale from the stone; occasionally, fragments of large flat implements that have been classed as agricultural (hoes or spades). These fragments have not been broken by want of skill in the workmen, but from undiscovered seams in the stone that did not show until the outer surface was thrown off. None of these fragments show any sign of use; in fact, some of them have not been wrought to an edge. I have several specimens of hoes from the same ridge beyond the settlement where it would naturally be cultivated, that from their highly polished working ends show long use. The lesson is that they are not made from great flakes, but rather represent the core from which flakes have been thrown off. Finished hoes and spades frequently have portions of natural stone partings that have not been worked off, and show them to have been worked from thin slabs. These slabs are a metamorphic thin bedded sandstone, belonging to what our State geologist, Prof. A. H. Worthen, calls the Chester group. They occur near the Saline, about 8 miles above the flaking ground, in an upheaval that has brought them to the surface with the upturned edges of the carboniferous limestone through which the salt springs flow. This is probably the source whence this quartzite was obtained, as slabs from 1 inch to 2 inches thick are found there; but there are many other locations stretching across Southern Illinois to the Mississippi River where they also occur.

It is the large agricultural implements that I refer to as having been made from quartzite slabs, some of which are as much as 16 inches long by 6 inches and 7 inches wide at the spade-blade end. There are many smaller specimens of the same form and character that have been regularly flaked from chert, white waxy quartz, yellow and brown jasper, that do not exceed 6 or 7 inches in length, their working ends highly polished by long use in digging. It is the large hoes and spades flaked from quartzite slabs that to me are evidence of a much higher degree of intelligence and skill than the most highly-finished spear and arrow points evince. Take an edge view of one of these large spades, and observe how accurately straight and free from wind the edge has been carried entirely around the implement, the flattening of one side and rounding the other; then observe that the long flat very slightly depressed flakes have been thrown off at right angles to the edge, even to those curving around its digging or cutting end, which appear to have radiated from a common center. If these flakes have been thrown off by blows so struck and directed as to preserve the cleanly lined edges, as the operator had carried them in his mind, a skill must have been acquired that we cannot approach.

In all the experiments that I have tried with a hammer, whether of stone, steel, soft iron, or copper, they have failed to produce the desired

result; the seat of the flake is more conchoidal, shorter and deeper depressed, whereas the direct *percussive pressure* throws off the shape of flake that we find has been done in making these spades. If this mode has been resorted to, it necessarily required considerable ingenuity in devices for holding the stone slab firmly, while the pressure was being applied in the right direction. The wooden clamp described by Catlin may have been used. The simplest device that occurs to me that will answer the purpose is a block of wood planted in the ground, with its end grain up, cut on top into steps, as represented in sketch, Fig. 6, the

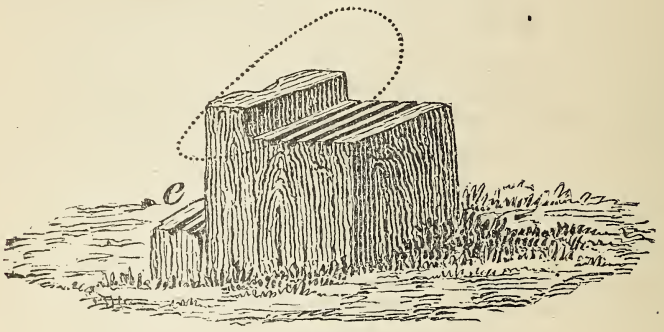


FIG. 6.

lower step having grooves parallel with the rise of the upper step; in one of these grooves the edge of the implement is placed, its back resting against the edge of the higher step, as represented by the dotted lines showing the form of a spade. When in this position, presenting the proper angle to the operator, a man holds it firmly while another applies the pressure. A lower step, *e*, with the back edge of top are hollowed out to receive the work, while its lower end rests in an indentation in the lower step. In this manner a spade can be firmly held while its cutting end is being flaked. I do not present this as a mode that was practiced, but as a device that answers the purpose, and I judge to be within the capacity of the ancient flint-workers, of whom there is nothing left but their chips and finished work.

Let any one experiment with a bone point in chipping flint; he will soon discover the value of a *dry bone*, a bone free from grease that will hold to its work without slipping, a bone with sufficient hardness to resist abrasion, a bone of strength to bear the pressure, and he will value such a pointed bone, and will understand why, with such a bone, John Smith's ancient arrow-point maker "*valued his above price, and would not part with it.*" I have been informed that the modern Indians free their flaking-bones from grease by burying them in moistened clay and wood ashes, not unlike the common practice of our housewives to remove grease spots from their kitchen floors.

The hunter or trapper described to me a mode still in practice among the remote Indians of making flakes by lever pressure combined with percussion, that is more philosophical and a better mechanical arrange-

ment than by the use of a flaking-staff, as described by Catlin. Figure 7 shows the manner of utilizing a standing tree with spreading roots

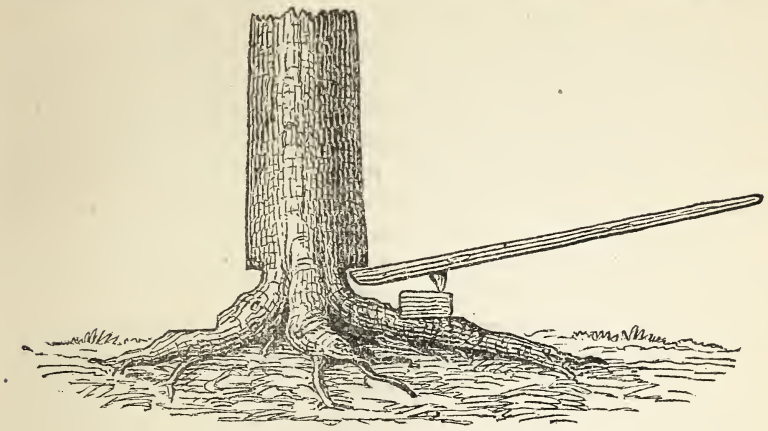


FIG. 7.

for this purpose; a flattened root makes a firm seat for the stone, a notch cut into the body of a tree the fulcrum for the lever; either a pointed stick is placed on the point of the stone where the flake is to be split from it, its upper end resting against the under side of the lever, or a bone or horn point let into and secured to the lever takes the place of this stick. When the pressure is brought to bear, by the weight of the operation, on the long end of the lever, a second man with a stone, mall, or heavy club strikes a blow on the upper side of the lever, directly over the pointed stick or horn-point, and the flake is thrown off.

Lubbock, in "Prehistoric Times," illustrated the Eskimo scraper as used at the present time in preparing skins. When we consider the close proximity of the flint workshop to the great salt licks on the Saline River, the flowing salt springs, the deeply worn buffalo paths still to be seen after having been subject to the destructive work of cultivation by the plow for more than a generation, where skins by the thousands must have been dressed, it is not surprising that the many chert flakes that have been split off with too great a curvature of their flat side in their length to admit of being chipped into arrow-points should have been utilized for scrapers, many of which are the exact *fac simile* of what Lubbock has illustrated as the Eskimo and others of the European type, of which he says:

"It is curious, that while these spoon-shaped scrapers are so common in Europe, they are very rare, if indeed they occur at all, in North America south of the Eskimo region."

I think it most probable from their close resemblance to refuse flakes and chips they were overlooked by early collectors. In the great game districts of the West, both in flint workshops and among the waste of Indian settlements, they are much more abundant than arrow-heads, or any other implements, with the exception of the small flint knives.

It is also in these game districts that what is known as the "bevel-edge arrow-points" are found, that have been a subject of much discussion as to their use. Foster says of the one he has illustrated: "The specimen represented is from Professor Cox's collection, and the two edges are symmetrically beveled, as if to give it a rotary motion." I have met many others that accept this idea, unmindful of the fact that a ship is not steered at its stem, but by the rudder, at its stern, and an arrow is not directed or held to its course by its point, but by the feather at the butt end of its shaft; and if a rotary motion was required it would naturally be given by placing the feathers spirally around the shaft. The broat flat sides of these beveled points would neutralize any effect from the short bevels in passing through the air.

I have heard it urged that they were reamers, and that the uniform bevel being in one direction, to cut as reamers they would have to be turned to the left, or, as our workmen say, "against the sun." From this it has been argued that the people who used them belonged to a left-handed race. The direction and uniformity in the bevels is to me evidence of exactly the reverse. Among all the points we find they are the simplest and easiest to form by chipping when laid on their flat. Nothing but the down pressure of flaker is required to separate a chip from a flat at a 45-degree angle. Suppose a flake that had been roughly shaped held flat on a block of wood by the fingers of the left hand, the tool in the right hand chipping from the point to the broad end by direct down pressure; then by turning the flake over and working the other edge in the same manner, we have in a center cross-section a form resembling a long-stretched rhomboid with sharp cutting serrated edges at the acute angles.

Colonel Long said that 2 inches was the greatest length of stone arrow-heads that he found in use among the Indians; that all longer

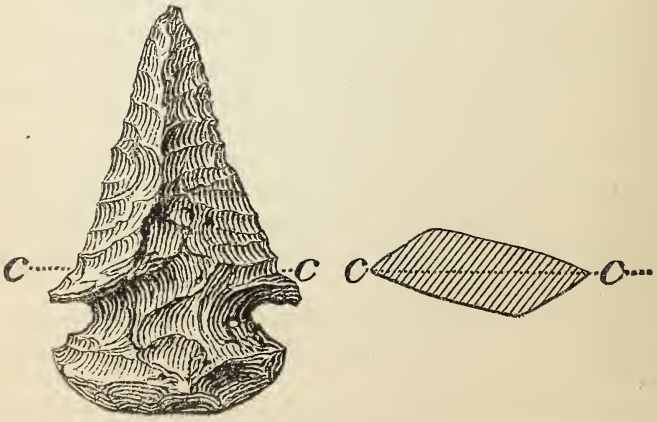



FIG. 8

not used for javelin and spear-heads were strongly hafted and used as cutting implements. This was confirmed by Catlin. It is more where and under what circumstances we find a stone tool than the tool itself

that teaches its probable use. In the case of the bevel-edged points, all I have found have been among waste where the users have lived, done their cooking and skin-dressing; and these were always associated with broken bones, muscle shells, fragments of pottery, flint knives, scrapers, &c., never scattered as if lost in hunting, as we find arrow-heads. One peculiarity of the bevel point is its strong, massive shank to secure it to a shaft or handle. This is shown in Figs. 8 and 9, with their cross-sec-

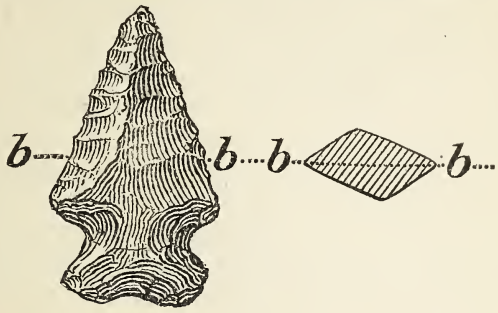



FIG. 9.

tions on the dotted lines; they are both of very dark, hard chert. Fig. 10 is from Bath County, Kentucky, near the Upper Blue Lick; it is of beautifully striped jasper; two sections are given to show the great thickness to give strength to the cutting-edges Fig. 11, yellow jasper; the want of symmetry in form is most probably the result of sharpening by fresh flaking. Fig. 12, a beautiful specimen of workmanship, showing a differ-

(Half size.)

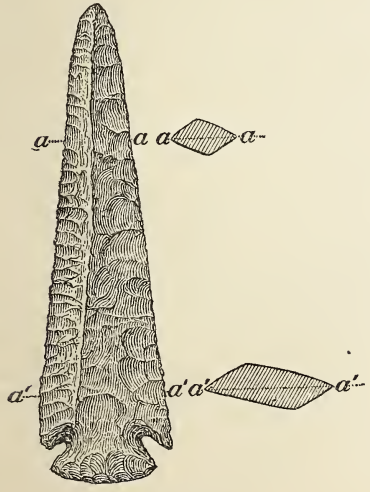



FIG. 10.

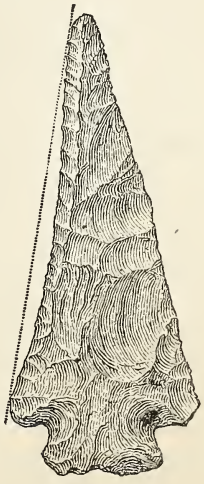


FIG. 11.

FIG. 12.

ent mode of attachment to a handle. All the above are drawn full size. In a small cache of leaf-shaped implements were found six of the bevel-edged points, all broken off at the shank in precisely the same manner,—pretty conclusive evidence of hard service, and probably brought to the workshop to have new shanks formed and to be re-hafted.

The only effort at drilling or piercing that I have found among the rubbish is a piece of yellow fluorspar 2 inches long, roughly rounded to $1\frac{1}{8}$ inches diameter; in one end a hole one-fourth inch in diameter has been drilled three-fourths inch deep; at the other end, a hole one-eighth inch diameter and only one-fourth inch deep. Many pierced implements have been found at or near dwelling sites associated with this flint manufactory, such as banner stones split through the drilled eye; some split fragments of tubes of great length, made out of hard schistose slate.

Among the waste are pieces of specular iron ore from Missouri, in evidence that it was worked here, probably into axes and weights or plumb-bobs. There is also evidence that argillaceous iron ore, the clay iron stone or carbonates of the coal measures, was a material extensively used. From the various forms of much oxidized pieces that I have found that will not bear handling, they appear to have been cutting or carving tools, probably used in the manufactories; though axes and celts made from this material are occasionally found in the vicinity of the salt licks, always deeply oxidized, peeling off in flakes that conform to the original form of the implement.

Many scooped or hollowed out blocks of sandstone or large flattish river bowlders, mostly sunk on both sides, that are classed as mortars for crushing corn, and with them crushing stones and pestles, have been plowed up on this flaking ground, but they are much more abundant on the dwelling portion of the ridge; also river pebbles partly pecked to an edge for celts, some of them roughly grooved for axes; but what surprised me most was the great number of what have been called cup-stones, by some nut-stones. These are frequently found scattered over Southern Illinois and Western Kentucky, and occasionally on all the tributaries of the Mississippi. But here they are found in mass. When the ground was first put under cultivation none were seen, and it was not until the great denuding floods had passed over it that they were exposed. On finding, just above the surface of the ground, the face of a fine specimen that showed a number of cups, I loosened and turned it over to examine the cups on the under side, and found it was lying on top of another. With pick and spade I soon exposed a group or pile of over twenty, and with them a number of slabs of the same sandstone that showed marks of having been used as rub or grind-stones, all from the millstone-grit series from the bluffs on the opposite side of the Saline. Further research developed a number of such piles, some only having the cup-like indentations, as illustrated at page 40 of No. 287 of the Smithsonian Contributions to Knowledge; others having a center depression of from 4 to 6 inches in diameter, similar to the rude mortars with the cups irregularly arranged around them. Subsequent overflows exposed many scattered over the entire flaking ground; they varied in size from large pebbles with a single cup on opposite sides, known to the early settlers as having been used by the Indians as nut-stones, up to massive slabs, having from two up to eight and ten cups

on a side, some too heavy for me to lift into my wagon without assistance (the largest I have seen was taken from near the center of a large mound in Bath County, Kentucky; it had twenty-seven cups one side and a greater number on the other). Many have been carried away from the flaking ground and used as cornerstones for log cabins or built into hearths and fire-backs to their wooden curb fireplaces, with their stick-and-clay daubed chimneys. So many being found where the manufacturing of stone implements has been so extensively carried on is suggestive to a mechanic that they were either made on the ground and kept on hand for sale, or they were tools in some way used in their works. That they were newly made can hardly be the case, for very frequently one cup has been worn into another. This, considering their sharp grit, rather points to some grinding process. Had they been for paint receptacles or pallets, we would expect to find them at dwelling places (where the Indians would naturally do their dressing and painting), and not in their workshops.

On the opposite side of the Saline River, due south of the flaking bank, a spur from the main ridge terminates abruptly by a very steep descent to the bottom lands, which at this point have a breadth of about 50 yards; at the foot of this bluff are masses of sandstone; they also project out of the steepest portion of the earth (at a time long past about 100 feet high), from the top of which the ascent is gradual to the crown of the ridge, forming a beautiful inclined plateau extending with the ridge until it is lost by steep inclines into the valley of the Little Saline, a small tributary that has cut through the ridge and falls into the Saline 1½ miles above its junction with the Ohio, and midway between its mouth and the first ripple. This plateau, when I first saw it, in 1854, was covered with heavy timber, many trees being from 5 feet to 6 feet in diameter. The broad valley of the Little Saline had some portions that are above the ordinary overflows cleared and under cultivation as early as 1834. The slope from the ridge to the Saline, including its bottom lands, have been under process of clearing since 1859. After the plow had loosened the soil, and it had been washed by the rains, both the slope and thebottoms have been rich in stone relics, the bottoms—particularly, in the agricultural implements of the Mound Builders. Climbing the steep directly opposite the flaking bank, chips of chert are found mixed through all the soil that has been worked from above, changing the rock bluff into the present steep incline, on the top of which on its turn from the steep to the gradual slope, another flaking place has been exposed. There within a space of two acres and not over an hour's tramp, on the fresh-plowed earth, I found scattered over twenty specimens of the cup-stones, which I collected and piled in a heap. This is another instance of their having been left among the offal of a workshop.

In the valley formed by the junction of the Big and Little Saline, occur extensive earth-works, long walls, mounds, &c. The largest of the

mounds has a height of 25 feet, length of base 225 feet, and width of 175 feet; its oval, truncated top is about 35 by 70 feet; its direction lengthwise is north 12 degrees west; it has a graded way on the east side, and was originally faced with stone; over one hundred wagon-loads have been taken from it and used in walling drains.

The earth-work and mounds extend on to the ridge to within one-fourth of a mile of the flaking ground on the bluff, thus connecting all these works. On the spurs near the Sabine are cemeteries and sepulchral mounds, from which many human bones have been turned out by the plow. I have opened several of the mounds, one of which, from a mechanical point of view, possessed great interest, for the primary interment over which it was raised was that of a worker in stone; and who knows but he may have been at a time the master mechanic or chief superintendent of the great flint works? The center of his mound was paved with the valves of the muscle shells of the Sabine, laid on the levelled surface of the natural soil in concentric rings, with the convex sides up. This shell pavement was about 7 feet in diameter; on its center was a pillow composed of twenty-seven pebble rub-stones of various grit and differently shaped edges. On these the skull was laid on its side; it was far gone in decay and crushed out of shape; the teeth much worn; the position of the large bones that escaped decay showed the man had been bent, bringing his knees near his chin, and laid on his side. He was a man of massive frame; the femur measured 19 inches and the tibia 15¼ inches long. Close to the crown of his head stood a rude clay vessel, badly broken; in front of the skull, on the rub-stone pillow, a gorget, finished with the exception of drilling hole for suspending it, on which lay a plumb-bob, a stag's tine scraped to a point; this broke to pieces on removing it. There were some bone splints, two canine teeth of a wolf, some pieces of galena, one crystal of mica one-half inch thick (the plates had not been parted), a few chert flakes, and a single finished arrow-point: on the shell floor of the mound, near its outer edge, one of the mysterious cup-stones, with three cups on one side and four on the other. I could not see that it had been placed with any reference to the center skeleton, but close to it, on the shell floor, lay a small-sized skull in a better state of preservation than the central one. A large hole in the back of it showed it had been crushed in, the broken portions either having been removed or decayed. Close to it lay the deadly slingstone, of roughly shaped chert. The decayed and broken bones of this skeleton had been thrown out in removing the earth from the shell floor, so that its position could not be accurately ascertained, though from portions of bone still remaining after the skull was discovered it was evident that the entire skeleton lay on the shell floor, and close to the central one, and was no doubt a primary interment.

Among these earth-works, where the densest aboriginal population have left their marks, stands a farm house and its outbuildings, with its garden on a pre-historic cemetery. From this point radiated the

early clearing and cultivation that has been most destructive to the long wall earthworks, and was the place of all others where I expected to find the cup-stones. The single-pit nut-stones and indented hammer-stones were plenty, and also the rude mortars, but the cup-stones were comparatively few.

An aged farmer, whose father with his family emigrated from Virginia into this section when it was Indian territory, and who as a boy worked at the early salt works, tells me that the Indians then here used the single-pit nut-stones, but they did not know anything about the cup-stones. He asked me if I could divine any use for them. On my suggesting grinding he said I was wrong and that he could tell me their use. I will now give his explanation as near as I can in his own language. He said: "If you want to see them in daily use, go to Patagonia, and you can any day see a lot of women squatting around one of these stones spinning yarn and talking scandal. You see, they strip and singe the hair off of a piece of raw hide, lay it on the stone with the flesh side up; they then squeeze it into the cup holes and put something on to hold it while it dries. Then you see every cup makes a step for the foot of a spindle to rest in, and holds just enough grease in it to make the spindle run slick; and, depend on it, that is the way the thread was spun here to weave the cloth that has left its impressions on the pieces of the old clay salt-pans. You know that our Indians did not know anything about them, or of salt either, for that matter; so how could they know what these stones were used for?" I understood him to say that when a boy he learned this from a Pacific whaler, who drifted to the salt works, and who related that on one occasion the vessel he was on laid up for some time in the Straits of Magellan, and that he then saw the Patagonian women using just such stones as steps for their spindles.

If that could have been the use of those that are so abundant here, we should expect to find them where the women dwell rather than at the flint workshops, the same reasoning applying to their use as paint pallets. If used for either of these purposes, why do we find the cup depressions on both sides, and many of the cups of various size, some just started and others worn one into another?

From the fact of the upper stone of the piles as they were left on the flaking ground being covered with such a depth of vegetable mold as not to have been discovered until after cultivation and exposure by the denuding floods, the finding one in the mound with the decayed skeleton of a stone-worker, the one I have before referred to as having been found near the center of a large mound in Kentucky, leaves little room to doubt of their having been, as well as the primeval workshops, coeval with the earth-works and their associated mounds.

There are other evidences of great antiquity in the condition of many of the granite and porphyry implements being honeycombed by the disintegration of their feldspar, leaving the silicious portions rough

and projecting. Celts and fleshers made of the carboniferous limestones have the silex skeletons of their fossils sharp and clearly marked.

From the location at the first ripple of the Sabine as a fishing point, the proximity of the salt-licks for the larger game, no doubt the place was frequented, if not permanently occupied, by the last of the Indians in this section, who have left their stone implements scattered broadcast over the country. They had lost value by the introduction of the nailers iron points, the rifle, knives, and the usual stock of the Indian trader. Had not this paper extended far beyond my original intent, I could give an accumulation of evidence of the rapid decline in the art of flaking stone.

From a mechanical stand-point, it is hard, if not impossible, to reconcile the accepted evolution of works of the stone age from flaked to ground and polished implements. It is true that specimens are found in all stages of progress from rough flake to polished implements in America as well as in Europe. But here in America, where the true flint is absent, a greater range of stone has been resorted to, and what we find flaked and afterwards ground and polished are mostly cutting tools, such as chisels, gouges, &c., of chert, jasper, or fine-grained quartzite that will maintain a keen cutting.edge.

For axes, either plain or grooved, the water-worn pebbles of greenstone, granite, or porphyry have mostly been selected. For fleshers, softer stones are common, such as limestone of various qualities, steatite, occasionally cannel coal, and the harder shales of the coal measures have been used for these wedge-shaped implements. But let the material be what it may, the pecking with a hard stone on a water-worn pebble, often found nearly of the required shape, to modify and bring it to a cutting-edge ready for grinding, by simply rubbing with sand and water on a flat stone, only required labor, patience, and perseverance, but not the knowledge and skill requisite to split off the flakes, nor the judgment, steady hand, and correct eye to shape them into the exquisitely symmetrical forms we find them.

I am not writing on or questioning the evidence of the antiquity of man, but simply on the instruments and tools he would naturally resort to, in his primitive state, to sustain life when depending for food, on the waters for fish, the earth for fruits, seeds, nuts, and roots, and on the chase for animals, not only for food, but, what was most essential for his comfort, skins for clothing, sinews, bone, and horn for innumerable uses. With the aid of a sharpened pebble (stone ax) he could attack a forest tree, and by the aid of fire shape its wood to his uses. Most probably scraping came in advance of cutting, and what could be better adapted for this purpose than the sharp edges of fractured flint pebbles?

With the wooden bow and arrow arose the necessity for an arrow-point harder than wood. If bone was used, the pebble scraper was essential. The river drift or gravel bars, when subjected to the grinding

and crushing action of drift-logs or rolling bowlders, would furnish many suggestive forms and shapes that a little ingenuity would apply, and out of which would naturally grow the art of flaking.

The streets of Paducah, Ky., are paved with partly rounded, angular, silicious gravel, mostly of jasper. Seeing heaps of this ready for spreading, I was struck by the many forms, mostly highly water polished, that if found on a flaking ground would pass for refuse flakes and rubbish left by the workmen.

On inquiry I was informed that this coarse gravel was from banks on the Tennessee River above the ordinary overflows. I selected many forms that any archæologist would pronounce to be the work of man.

A heavy wagon, loaded with hogsheads of tobacco, drawn by five or six yoke of oxen, passed over the fresh-spread gravel with a sharp, crushing, grinding sound. On examining the wheel tracks I was surprised to find the slight impression the iron tire had made on the surface stones. They had been pressed aside from the wheels, leaving a slight rut, those under the wheels compressed together, but very little broken; not sufficient to account for the sharp, crackling noise made as the wagon-wheels passed over them. On examining the effect from the tread of the wheels to the old road-bed, a depth of about 6 inches, I found most of the larger gravel stones under the top layer split, some into flakes, the fractures in various directions, some crossing others. This spread from the width of the wheel-tires to about three times as wide on the old road-bed. Many of the fresh fractures presented the forms and appearance of genuine cores, and would be mistaken for the work of man. It was a beautiful illustration of the effect of pressure on small points of contact. Our lady friends, often inveterate iced-tea drinkers, when they find a lump of ice too large for their glass, will, with a common toilet-pin between thumb and finger, press its point into the ice, tap its head with the handle of a case-knife, or give it a click with a thimble. The cohesion is destroyed and the ice splits with just such a fracture as is made by impulsive point pressure on the more tenacious and refactory chert.

These Paducah observations led to considerable investigation as to the action of lodged drift-logs on gravel-bars, and finally to an experiment that I should recommend the Smithsonian Institution to try on more extensive scale than I was able to.

I filled a metal cylinder with pebbles of various sizes and shapes, brought a pressure by a screw on them through a plunger; immediately a crepitating sound was heard, which as the pressure increased became sharper and louder, at times almost explosive, as the interstices became filled with broken fragments, producing side pressure and cross fractures. The sound became more confused and died away. On emptying the cylinder, the result was many representations of the rude implements found in the drift.

## COPPER IMPLEMENTS FROM BAYFIELD, WISCONSIN.

By Colonel CHARLES WHITTLESEY, *of Cleveland, Ohio.*

In grading the streets of Bayfield, Wis., about the year 1864, the workmen found a copper implement in the gravel. The accompanying figure, one-half the natural size, will give some idea of the shape and character of the specimen (Figure 1). *A* is an upright outline or elevation, with the concave surface toward the rear. *B* is a top view or plan of the implement as seen from above, and *C* a vertical or longitudinal section through the middle at the dotted line *c d*. The irregular space *e e* shows a flaw in the metal.

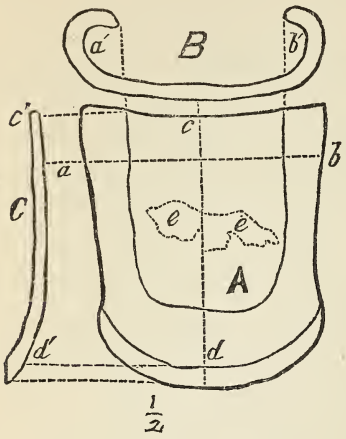
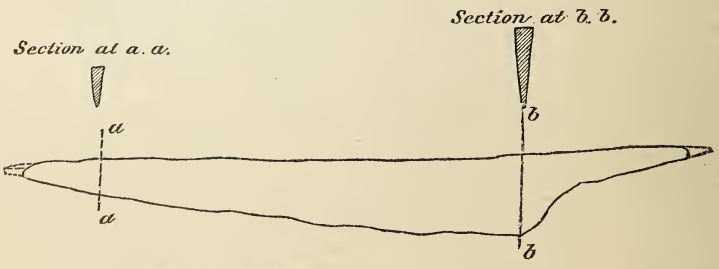



FIG. 1.

Several have been found elsewhere in the United States and Canada of about the same outline, but generally the blade or flat part is much larger in proportion to the shank or socket. Where the two parts are equal they are regarded as spades. One described by Mr. Squier in "Ancient Monuments," taken from a sepulchral deposit near Brookville, Canada, is about 10 inches in length. It could be used in digging by inserting a handle several feet in length, with a notch or offset for the foot near the bottom.

Those with the short bit may have been spades worn out by use. Their edges are generally sharp, as though they had been used to cut wood or some other hard substance. After they were well worn as spades they could be turned into an adze by inserting a crotch, with the plane of the blade at right angle with the plane of the handle, or into an ax by making the planes coincide.

*Found in 1866 on Presque Isl. one of the Apostle Group Lake Superior: on the Surface.*

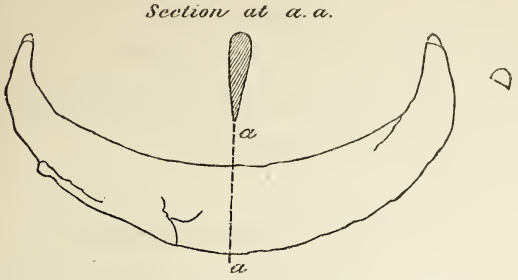



*Copper Knife from Bayfield, Wisconsin.*

FIG. 2.

Figure 2 represents a copper knife (half-size) found on Presque Isle, one of the Apostle Group of Lake Superior, in 1866. It was lying on

the surface of the ground, and is now in the possession of Mrs. E. M. Haywood, of Bayfield, Wis. The thickness near the ends is shown by the cross-sections at *a a* and at *b b*.




*Copper Cutting tool from Knife River, Minn.*

FIG. 3.

Figure 3 represents a copper cutting tool from Knife River, on the northwest shore of Lake Superior, Minnesota. It was found in 1865, and is now in the collection of the Western Reserve and Northern Historical Society of Cleveland, Ohio. It was evidently cold-hammered, and the surface is rough from corrosion.

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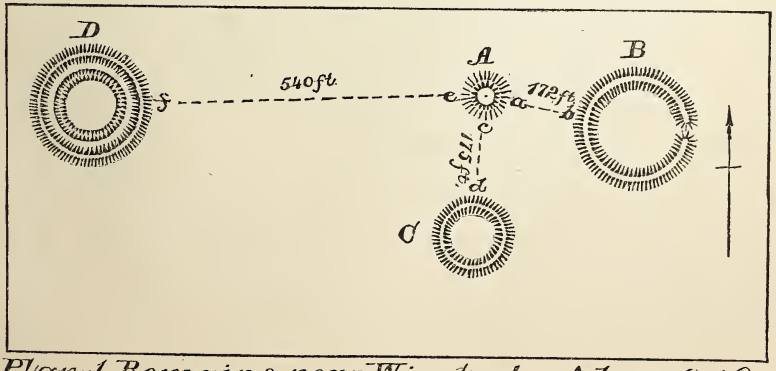
## ANCIENT REMAINS IN OHIO.

By J. P. MACLEAN, *of Hamilton, Ohio.*

*Works near Winchester, Adams County, Ohio.*—Winchester Township is located in the extreme northwestern corner of Adams County, Ohio. The terminal moraine of the great ice age enters the township at the northeastern corner, extends diagonally across it, and passes out at the southwestern extremity. The township, for agricultural purposes, is the richest in the county. The soil, for the most part, is poor, known as cold clay, and the surface broken by the tributaries of Brush Creek.

North of the village of Winchester, a distance of one-half mile, is a series of circular works, which for fifty or more years have been plowed over. Near the center of these works is a mound (*A*) (Plan 1) 8 feet




*Plan 1. Remains near Winchester Adams Co., O.*

high, conical in form, which has never been disturbed by the plow From the top to the bottom on the east side is 50 feet; from top to circumference on north side 48 feet. East of this mound (*a b*), a distance of 172 feet, is the circle *B*. The wall is almost level with the surrounding surface, although from 6 inches to 1 foot high along the line *g b h*. The remaining part of the work is difficult to trace. The gateway cannot now be located, although it is said to have faced the east. South of the mound (*c d*), a distance of 175 feet, was formerly another circle (*C*), but no trace of it exists at the present time.

West of the mound (*e f*), a distance of 540 feet, is the circle *D*, 150 feet in diameter. This work presents a wall averaging from 10 to 15 inches in height with a ditch in the interior. I was unable to locate a gateway.

When first discovered these works were covered with forest trees. The walls averaged 5 feet in height. The material is composed of clay of the same kind as that in the immediate vicinity. The mound has never been opened. The spot is level, and appears to have been well chosen. Following are the measurements:

(*A.*) Conical mound, 8 feet high; east to top, 50 feet; north to top, 48 feet.

(*B.*) Circle 172 feet east of mound. Circle 510 feet in circumference.

(*C.*) Obliterated circle 175 feet south of mound.

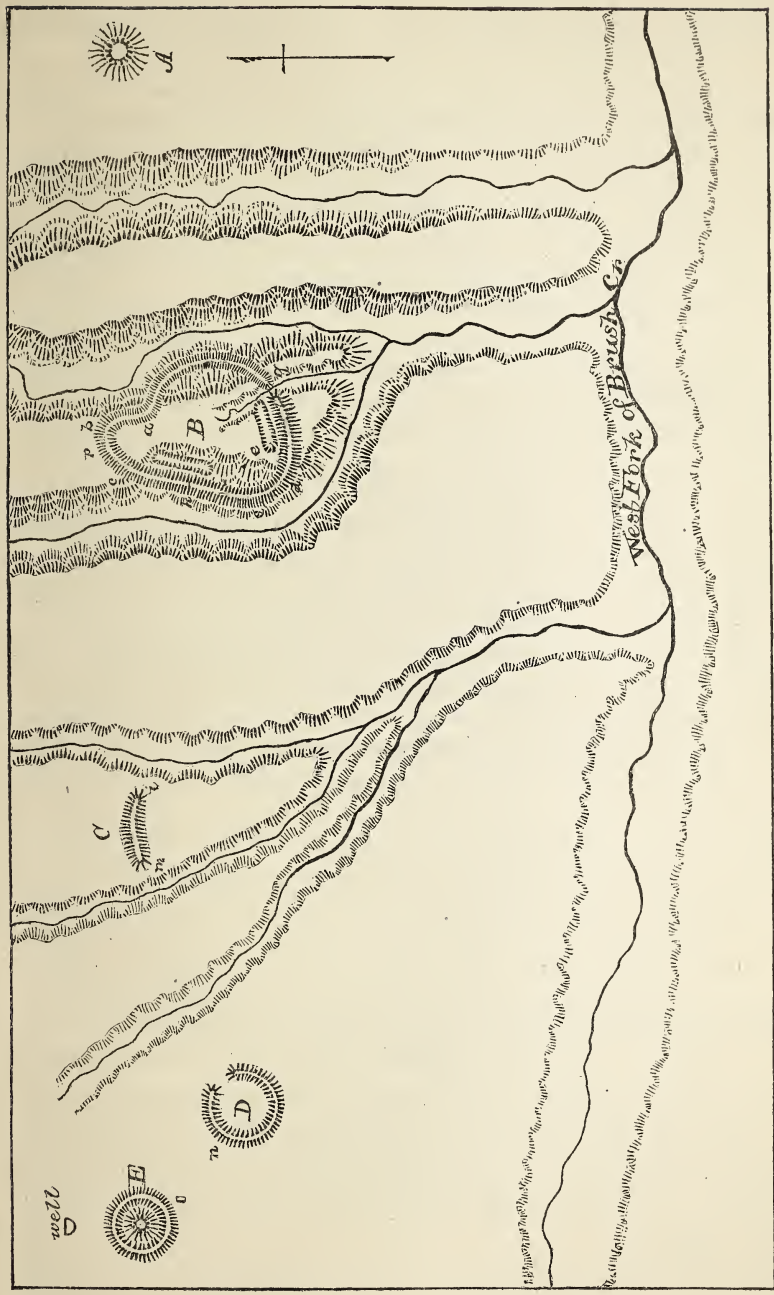
(*D.*) Circle 540 feet west of mound. Circle 150 feet diameter.

One mile and a quarter north of these works, located on a high point of ground, is a mound (Entry No. 3, Map *b*) removed a few rods west of the Hillsboro' turnpike. The mound is conical, 14 feet in height, with a circumference of 250 feet at the base. Original height, 20 feet; solid contents, 2,098 cubic yards. From its summit a fine view of the country may be obtained.

On Entry No. 8 (see map) is a small mound (*c*) 3 feet in height.

*Works in Eagle Township, Brown County, Ohio.*—Eagle Township (see map) is bounded on the north by Highland County (White Oak and Concord Townships); on the east by Adams County (Winchester Township); on the south by Jackson Township, and on the west by Washington Township. The general surface is comparatively level, although the west fork of Brush Creek has made a deep valley running from west to east. Some of the tributaries of this stream have formed deep ravines. Where these ravines have cut through the glacial till the Hudson River blue limestone is exposed, save in one spot (see map Z, entry 398), I noticed Clinton strata.

The ancient remains located on entries 398 and 1316, in company with Prof. J. W. Fertig, I measured, May 16, 1885 (see Plan 2). The mound *A* is located on the line between Brown and Adams Counties. It is located on a knoll, several of which occur in the immediate vicinity. It is difficult to tell just where the base of the mound begins. If the place I assumed to be the base is the correct one then the mound is 328




*Plan 2. Remains in Eagle Tp., Brown Co., O.*

feet in circumference; from northwest base to top, 70 feet, angle 11°; southeast to top, 44 feet, angle 15°; solid contents, 1,533 cubic yards; height, 14½ feet. A view of the country to the southeast is here presented.

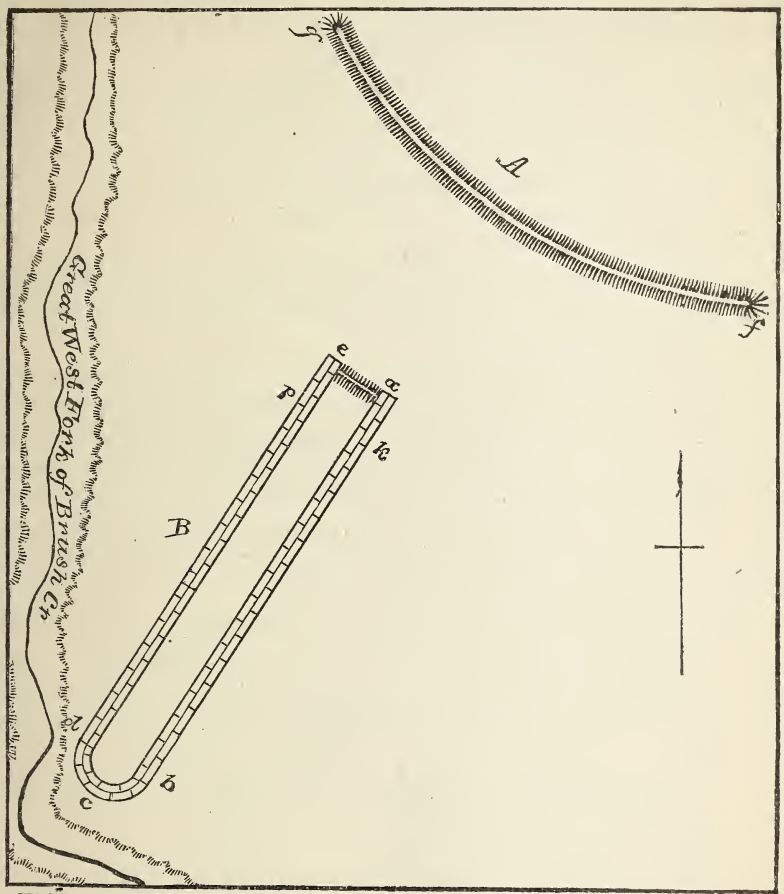
Measuring due west and passing through two deep ravines we come to fort (B), striking it at *a*, and removed from the mound a distance of 1,970 feet. This work is entirely surrounded by deep ravines, save a narrow strip of land at the north. That part of the wall marked *p c h d e g* is in woodland. From *p* to *h* the wall is about 18 inches high; from *h* to *d* not over 12 inches, while from *e* to *g* it will average 32 inches. A ditch in the interior extends from *c* to *h*, also from *e* to *g*. The highest point of land is at *p*, thence the wall extends rapidly down the ravine until it is almost level with the bottom at *s*, thence it rapidly rises to *e*, then declines to *g*. From *g* to *a* the wall is entirely obliterated, that part of the work having been under cultivation for the past forty years. From *e* to *b* is a gradual ascent, the distance being 985 feet. The distance from *a* to *b* to *c* to *d* is 1,291 feet; from *d* to *e* 75 feet, and from *e* to *g* 130 feet; from *a* to *b* 300 feet, and from *a* direct to *c* 400 feet; from the point *c* (*B*) we started directly west a distance of 1,875 feet, as we measured it. This number must not be relied upon as being correct. Owing to the density of the underbrush on the west side of the ravine we were forced to deviate from a straight line, but the result was as near as we could reach it without cutting a straight path. At the end of the distance measured, and between two small ravines, on a piece of land sloping to the southeast, is an arc of a circle (*C*) 288 feet in length. The wall has been plowed over for fifty years, yet is 2 feet in height, with a base 20 feet in diameter, and accompanied by a ditch in the interior.

Measuring westward 1,993 feet, and through open grounds comparatively level, we reach the mound *E*. This mound is 332 feet in circumference at the base; from north side to top, 44 feet; from south side to top, 44 feet; across the top, 21 feet; slope angle, 34 degrees; height, 24½ feet; solid contents, 2,516 cubic yards. It is perfectly symmetrical; commands a fine view of the surrounding country; has never been disturbed by plow, pick, or shovel, and is one of the most beautiful mounds in the State. It is surrounded by a circle 160 feet in diameter. The circle, however, is plowed almost down to the general level of the surface. There are indications of a gateway at the east. At a distance of 640 feet southeast of the mound is the circle *D*, 865 feet in circumference. The original height of the wall was 10 feet. It is now about 2 feet, and 40 feet in diameter at the base. The gateway is towards the northeast.

Due north of the mound a distance of about 300 feet was a walled well. The history of this well is not known; it was there when the first settlers came. It has been filled up, and now plowed over.

The whole distance from the foot of the mound *A* to that of *E*, as

measured, is 6,526 feet. The figures run 1,970, 1,875, and 1,993. The difference between the two opposite figures is 118 feet. The average distance would be 1,946 feet, while the average of all, including works not given, 2,175. It is more than probable that some system in these measurements was followed.




*Plan 3. Remains in Concord Tp., Highland Co., Ohio.*

*Ancient remains in Concord Township, Highland County, Ohio.*—Three and one-half miles northeast of the mound *A* (Plan 2) are ancient remains (see Plan 3) located on Entry 281, Concord Township, Highland County, Ohio. The spot where these works occur is a secluded one. Great west fork of Brush Creek makes a bend almost at right angles. The land slopes from the northeast. Before reaching the creek a bench is met, upon which these works are built. No view can here be obtained of the surrounding country, because it is literally hemmed in by hills. The most interesting work is the stone structure marked *B* (Plan 3). The entire wall, except from *a* to *e*, is composed of Hudson River limestone. The stone has been burnt, and for a long period exposed to the

elements. The wall has been thrown down, yet its regularity is perfectly preserved. The following are the measurements: From *a* to *e* (inside to inside of wall), 32 feet; *b* to *d* (inside to inside of wall), 32 feet; *b* to *c*, 125 feet; *e* to *d* to *c*, 165 feet; *a* to *b* to *c*, 165 feet; thickness of wall across base at *c*, 21 feet; thickness of wall across base at *k*, 24 feet; also same at *p*. Height of stone wall, 2 feet. From *a* to *e* the wall is composed of earth, is 8 inches in height and 7 feet in breadth. The floor on the interior of this work is perfectly level.

Fifty-two feet due north-east of this work is a section of a circle (*A*). The wall has been plowed over, and will not average over 1 foot in height by 22 feet across. The distance from *g* to *f*, following the curve, is 225 feet, and on a straight line 130 feet.

Two hundred and eighty-five feet due east of *a* (*B*) is a mound 3 feet high and 22 feet diameter.

At a distance of one-fourth of a mile northeast of (*A*) is another mound located upon a hill, but not having a commanding view of the country, nor of the works just described.

It is fair to assume that the works near Winchester, those of Eagle Township, and the ones just described, belonged to the same people. There is no evidence that they were constructed in different ages and by different people. The nearness of the structures to each other, and their evidently unfinished condition point to the same time and the same people. On a straight line some 6 or 8 miles east is the Great Serpent Mound. This is removed a distance of about 5 miles from "Fort Hill," in Brush Creek Township, Highland County, Ohio. This work has been figured and described* in "Ancient Monuments," with the additional information that "no other remains, except perhaps a few small, scattered mounds, in its vicinity." Near the southern foot of the hill upon which the fort is located is a series of circular works, now almost obliterated.

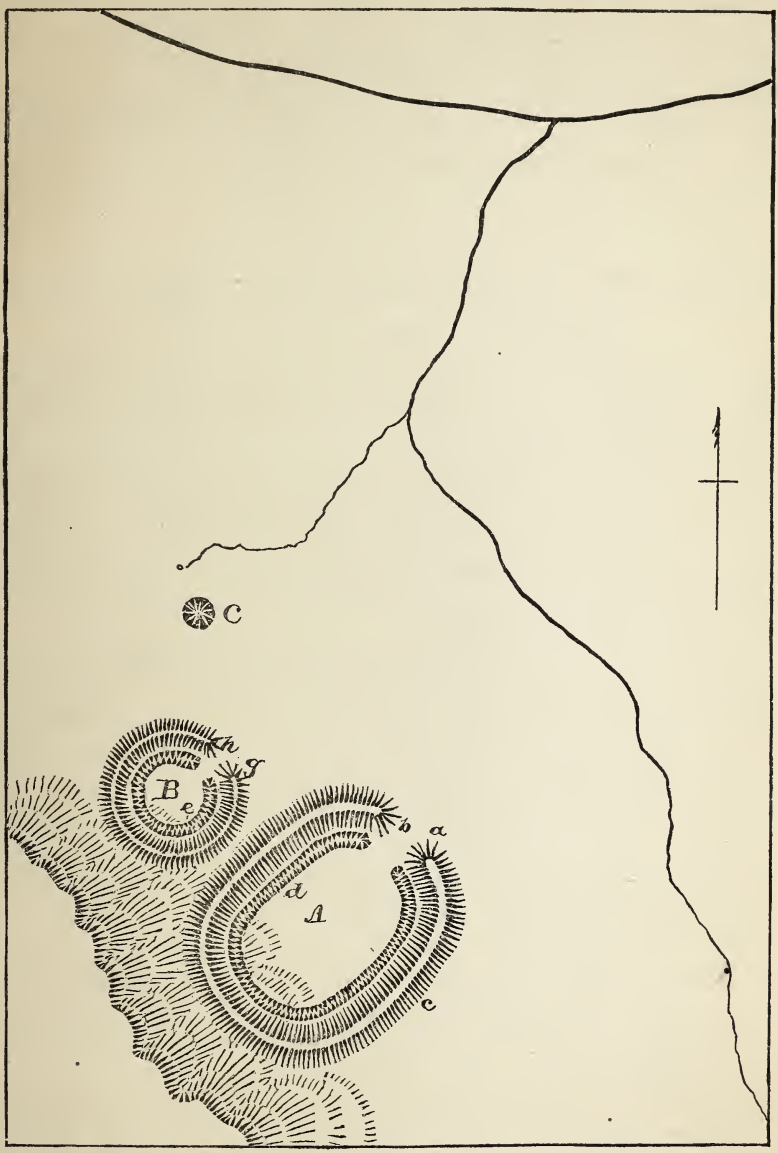
It is a fair assumption that the builders of "Fort Hill" and the circles near it belonged to a clan separate, yet related to the one that constructed the works near Winchester.

Now, the so-called "serpent effigy" is composed of a frog, an egg, and a serpent. Why may not one of these clans have been the frog, and the other the serpent, or snake; and the series of the effigies represent that the snake clan came from the frog?

*Ancient remains in Clarke County, Ohio.*—On May 23, 1885, in company with Prof. J. W. Freeman, I visited the works located on the land of Benjamin Newlove, section 29, Harmony Township, Clarke County, Ohio. When these works were first discovered only saplings were growing upon them. The works are situated on the side of a hill descending towards the northeast (see Plan 4). The larger work is oblong, the longest diameter being 320 feet, and the transverse 250 feet. The gateway *a b* is 33 feet; the entire wall is 821 feet long; the wall at *d* is 7 feet

* "Ancient Monuments," page 14.

8 inches high; at *a* and *b* 4 feet high, and 25 feet wide at the base. The width at *c*, 38 feet; at the same point the ditch is also 38 feet across.




Plan 4. Remains in Harmony Tp., Clarke Co., O.

The land at *c* is 15 feet higher than the land at the gateway. The ditch is in the interior, extending the whole distance around save at the gateway. Here the land is perfectly level. The ditch does not touch the embankment. A platform averaging 4 feet across follows between the line of embankment and the ditch.

By the side of the work (*A*) is the circle (*B*). From the bank of one to that of the other at the nearest point is 34 feet. The bank is 560

feet in circumference, to which is to be added 45 feet for the gateway *g h*. The wall is 5 feet high, with a diameter at the base of 25 feet. The work is accompanied by an interior ditch, which, however, does not extend across the gateway. Between the interior foot of the embankment and the ditch is a platform 20 feet in width.

One hundred and forty feet north of the small circle is a circular estufa, walled with small bowlders. Forty feet still farther north is a spring of clear cold water, which has never been known to fail.

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## A PRIMITIVE STOREHOUSE OF THE CREEK INDIANS.

By CHARLES C. JONES, JR., *of Augusta, Georgia.*

In his description of the customs of the ancient inhabitants of Virginia, William Strachey* says: "Their corne and, indeed, their copper hatchetts, howses, beades, perle and most things with them of value, according to their own estymacion, they hide, one from the knowledge of another, in the grownd within the woodes, and so keepe them all the yeare, or untill they have fitt use for them, as the Romans did their monies and treasure in certaine cellars, called therefore as Plinye remembers, *favissæ*; and when they take them forth they scarse make their women privie to the store-house."

In plate xxii of the Brevis Narratio [Francoforti ad Moenum MDXCI], le Moyne de Morgues furnishes a drawing of what, in the accompanying text, is called a *publicum horreum*. It is situated upon the low bank of a river, and toward it canoes—filled with corn and fruits, and propelled by Florida Indians—are tending. Such granaries or public receptacles were, by the peoples dwelling within the limits of the extensive domain then known as Florida, built of stones or earth, and roofed with palmetto leaves and clay. For their location cool spots were selected, where protection was found against the violent rays of the sun. They served as depositories for maize, fruits, nuts, nutricious roots, dried fishes, alligators, deer, dogs, and other jerked meats. Hoards of corn, nuts, and meat are frequently mentioned in the early narratives as existent among the primitive peoples of this region at the time of primal contact with Europeans. They were both public and private.

In alluding to the agricultural occupations of the Southern Indians Mr. Bartram observes: "When the fruits of their labors are ripe and in fit order to gather in, they all, on they same day, repair to the plantation, each gathers the produce of his own proper lot, brings it to town, and deposits it in his own *crib*, allotting a certain portion for the public granary which is called the King's crib because its contents are at his

* History of Travaile into Virginia, p. 113. London. (Printed for the Hakluyt Society, 1849.)

disposal, though not his private property, but considered as the tribute or free contribution of the citizens of the State at the disposal of the King." He further states that the common or public granary served the valuable purposes of assisting the needy when in sore want, of furnishing entertainment for strangers and noted guests, and of supplying warriors with provisions when they were setting out on hostile expeditions.

That the American Indians often concealed in the ground and in secure receptacles not only the products of their agricultural labor and trophies of the chase, but also objects manufactured of clay, shell, and stone, is a fact capable of easy demonstration. Without enumerating the proofs, or pausing to cite authorities in support of the frequent use by the Southern Indians in the sixteenth century of storehouses, both public and private, we desire to call attention to the existence of one of these primitive structures upon the plantation of Colonel Seaborn Jones, at Mill Haven, in Screven County, Georgia. For quite a century it has remained unchanged. It is located upon the declivity of the right bank of Briar Creek, in proximity to that stream, and in the midst of a beautiful forest of oak, holly, and pine. Cylindrical in shape, this receptacle has a diameter of 8 feet, and is about 6 feet deep. The excavation in the ground was at first carefully and regularly made and, when completed, the sides and bottom were covered with a uniform layer of well-kneaded red clay 4 inches in thickness. These clay walls, the interior surface of which was pressed hard and smooth, are still quite perfect. As one looks upon the structure, it presents the appearance of a huge cylindrical terra-cotta vessel let into the earth. There is some indication of the action of fire in hardening the walls. To Briar Creek, and especially to this neighborhood, did the Creek Indians resort to fish and hunt. The adjacent bluffs and fields give token to the present day of former and long-continued occupancy. Village sites may still be seen littered with fragments of earthen vessels, flint chips, spear and arrow points, grooved axes, scrapers, and other objects of primitive manufacture. Even now this stream abounds in fishes, turtles, and alligators, and the swamp, at an early period, was filled with deer, wild turkeys, and other game held in repute by the natives.

Doubtless, during the use of this receptacle, it was furnished with a roof or covering which long since perished. It is probable that in it were stored, from time to time, the fishes caught by visiting Indians. These, having been previously dried, there accumulated until the season arrived for the homeward journey, where they were removed and transported to the permanent lodges of their captors. It is hoped that care will be exercised in the preservation of this interesting object.

## SHELL HEAPS AND MOUNDS IN FLORIDA.

By JAMES SHEPARD, *of New Britain, Conn.*

In February, 1884, in company with Dr. F. H. Williams, of Bristol, Conn., I visited Palatka. Many walks about the town were covered with small snail shells which were gathered from large deposits in that vicinity. It was a common belief that these were marine shells; and frequent was the inquiry why the Indians brought these shells from the distant sea. The answer is, "They did not," for the shells are mostly, those of the river snail, *Vivipara contectoides* (Binney). Several of whom I inquired thought that like specimens of live shells could not be found near Palatka. In this opinion they are probably mistaken. On being informed that there was a shell heap on the Saint John's River a few miles below Palatka, four of us started out the next morning to explore the land in that vicinity. Late in the afternoon one of our party discovered a shell heap. It was on low ground, in the woods or hummock, probably not far from the Saint John's River, although the river was not visible. It was literally a heap, quite irregular in form, covering three or four square rods of ground and varying in depth from 2 to 5 feet. It was just such a heap as one would expect a pile of débris to be. There were no indications that any shells had been removed or that the heap had ever been dug into. On the surface the shells were but little broken, and the entire heap appeared to be composed of two kinds of shells, the *Pomus depressa* (Say) and *Vivipara contectoides* (Binney). By digging below the surface, pieces of river mussels or *Unios* were found, very much decomposed and covering the other shells with a nacreous paste. Bones of small animals and birds and flint chips were numerous, with many pieces of pottery and an occasional arrowhead. There were only a few shells in the entire heap of any genera other than the *Pomus*, *Vivipara*, and *Unio*.

On sailing up the Saint John's River we saw several shell heaps on the banks of the river apparently of the same general character, only some of them were much more extensive. We stopped only at Sanford, and there found a shell heap a mile or two below the steamboat landing. This was much larger than the Palatka mound and spread irregularly over the ground. Shells had been carted away from here and the heap dug into in many places by relic hunters. All of the shells were of the same three kinds, *Pomus*, *Vivipara*, and *Unio*. The shells at the surface were very much crushed, indicating that they had been much trodden on. Many pieces of pottery were scattered about over the surface, and others were found by digging. Arrowheads and flint chips were infrequent. In some places indications of ancient fires were found, the shells being burned and firmly cemented together. Below the layer of cemented shells and ashes the shells were found in a remarkable degree of preservation, some of the *Vivipara* showing the

four bright brown bands about the body-whorl quite as distinctly as in the day when they were taken from the water. Others seemed to have changed their substance, and were white and glossy with a porcelanous appearance. Here, too, we found a lump of hardened red paint. Some pieces of pottery were perfectly plain, while others were ornamented in various patterns both by scratching and by depressions. Some of the checkered ornamentations seemed to have been made by repeated impressions with a stamp, such as would be produced by making channels in a flat surface at regular distances apart and at right angles to each other, and then, in using the stamp, turning it between each two impressions so as to make the lines in one depression stand obliquely to those of the adjoining one. At the junction of two such depressions the overlapping or intermingled lines were plainly visible. One piece was ornamented by straight parallel depressions, and then, after the depressing implement was withdrawn and while the clay was yet soft, other depressions were made transversely to the first ones, but not so deep, the ribs between the first depressions being flattened down on the cross-lines and partially filling the first depressions. One piece was found of such an arc, that supposing it was from a round vessel the diameter of said vessel was 29 inches.

Near this shell heap were two mounds of symmetrical shape, formed mostly of earth, but partly from shells like those in the heap. The earth was the same as the surrounding soil. These had been dug into considerably, and on digging farther into one of the holes we found the leg and foot bones of a human skeleton, but no implements or ornaments.

In returning we found by a ditch on the flats of the St. John's River, a smaller shell heap of fresh shells, but not thick enough to cover the ground. The shells were identically of the same three kinds. The fresh operculum lying by these shells showed that they had recently been taken alive, and that their meat had been picked out by some small animal.

The long-billed curlew (*Numenius longirostris*) is said to eat the live animal from these shells. These shells were of great interest to me for they put at rest all speculation as to where the Indians obtained their supply of food, of which the shell heaps are the refuse, and proved to my mind that they took their shell-fish from the river whose bank they have lined with shell heaps, and also that the same species of mollusks are living there to-day. Undoubtedly this fact has been noted and published before, but there are many who still believe that the shell heaps of the St. John's River are composed of marine shells. When we consider the resemblance of the *Pomus* to the *Natica*, it is not strange that such opinions may be formed by a cursory observer.

Our next stop was at Tampa, Hillsborough County, and our first excursion was to Rocky Point, Old Tampa Bay, about 5 or 6 miles westerly from Tampa, near where the salt works were located during the civil war. Here was a large mound of marine shells situated at the base of

the point and extending entirely across it. Oyster shells formed the major part of the pile. Several holes had been dug into the surface which, with the general appearance of the place, indicated that it had frequently been visited. The rocks of which the point is mainly formed and from which the point was named, consists of fossil coral. The material for many of the rough implements found in this vicinity evidently came from this point.

Most of the surface specimens yielded by this heap were found at or near the base of the slanting sides of the pile. In addition to arrowheads, scrapers and rough-shaped implements of quartz, we found pottery and quite a variety of shell and bone implements, the latter being entirely new to us. Among these were several celts quite similar to those illustrated in "The Archæological Collection," p. 67, figs. 254 and 255, also chisels, gouges, pendants, and beads made from the columella of large shells, and smaller chisels made from bone, besides other rough pieces which we suppose were implements of some kind. One piece of pottery was ornamented with impressions of a long spiral shell of the genera *Cerithum*. Near by we found large numbers of live specimens of this shell, some of which quite closely fitted the depressions in this piece of pottery.

On the land of Colonel Culbreath, about 2 miles from Tampa, and on the shore of Old Tampa Bay, is what is termed a "shell hummock." It is cultivated as an orange grove and a market garden. It was probably once an immense shell heap, but now it is scattered over several acres. A little to one side of the center of the lot the ground is slightly elevated and nearly or quite half of the surface material is shell. From this point the shells are less numerous, as they are spread out in all directions, growing gradually less until the soil is free from them. Here we found an abundance of quartz implements and worked pieces of ill-shaped forms, that might or might not have been intended for implements. Others were of fossil coral limestone, like the coral at Rocky Point farther up the bay. Some pieces of the quartz and coral were nearly spherical, the whole (in some cases only a part) of the surface having been formed by chipping. Perhaps, in the absence of natural pebbles in this section, these had been worked out for use as a substitute; perhaps to use as club heads, incased with rawhide. We found rough and somewhat rounded pieces of fossil coral with pit-holes on opposite sides, and a single piece of soapstone, about one and a half inch in diameter by half an inch thick, but its surface was not worked sufficiently to show its use. I refer to it only because it is a material which has not to my knowledge ever been found in nature within several hundred miles of South Florida.

Of shell and bone implements we found all the kinds collected at Rocky Point, celts, gouges, pendants, beads, and also the columella of small conchs, worked into small round shafts pointed at each end. Some of the columella of the larger conchs were worked to a point on one end. There were triangular and other shaped pieces of the shells

of the common hard-shell clam worked to a sharp edge on all sides. One spoon was made from the umbo of one of these clam shells, another from the outer whorl of some large conch. We also found beads made from the *Oliva literata*, as illustrated by fig. 260, p. 69, "The Archæological Collection," and large conch shells, perforated and worked to form club heads. Some were minus the hole in posterior surface of the spire, but were otherwise exactly like those described by Dr. Rau on page 66 of said book. A friend of mine has a similar supposed club head from South Florida, consisting of a like conch shell worked in the same manner at the small end and perforated by two holes in the outer wall, but without the notch in the outer lip, so that the handle passed to the right of the columella instead of at the left. The necklace or bead conchs having two holes and truncated at the apex like fig. 257, p. 69, we also found, and it was the first time our attention had ever been called to them. We wondered if they might have been toy club heads for children, but Dr. Rau's book informed us otherwise. In most of these shells the perforations have been so formed that when strung and disposed about a person's neck or chest, the lips and the most brightly colored parts of the shell would be exposed to view. One small disk from a hard clam shell having ragged edges and a beveled perforation in the center was found. The hole was almost identical with those made by boring worms and shells, and one person who saw it was confident that this was only an accidentally broken piece having such a worm-bored hole. Upon having his attention called to the fact that the bevel was at the inner surface of the shell, he was willing to accredit the supposed work of a worm to an Indian. I mention this to show the importance of close observation and how a very little thing may often decide a question. A workman in the field informed us that he often plowed out parts of shells that had been engraved. We visited the hummock several times but found nothing of the kind. At last the workman found one and showed me. It was nothing but a plain unworked columella with the outer whorls broken off undesignedly. He had mistaken the natural spiral lines for carvings. This is about as reliable as the information one can get from those who have never paid special attention to archæological specimens. Fragments of pottery of various patterns were abundant here. The shells were all marine shells excepting such land shells as had probably found their own way to that place.

By Hillsboro' Bay, at the mouth of the Alifia River, several miles below Tampa, is a shell heap called "Bull Frog Mound," so named from the fancied resemblance of its shape to a bull frog when viewed from the water in sailing up the bay. This is by far the most extensive shell heap of any that we visited. It is formed of two mound-shape piles at considerable distance apart, while all the ground between these piles is covered with shells to the depth of several feet. The larger pile is reported to be 60 feet high and stands close to the river; in fact the shells extend well down into the river as if filled in beyond the original

bank, so that the mound itself, at this point, now forms the river bank. A large oak tree stands at the very summit of the mound. The lesser pile has been considerably reduced by burning the shells for lime. In front of the mound, looking towards the bay, is a point consisting of a flat salt marsh covered with rushes. The mound is composed largely of oyster shells and appears to have been frequently visited of late. Relics were scarce, and those we did find were of the same class as we had found before. The only relics which could be found here in numbers were the small perforated and truncated conchs for necklaces or beads.

Bordering on the city limits of Tampa, Hillsboro' Bay, and the mouth of Hillsboro' River, is the garrison called "Fort Brooke." Here are two ancient earth mounds which have been dug into considerably, but we could not learn that anything of special value had ever been found. On the ground about the mounds we found bits of pottery, flint chips, a few arrow heads and rough implements. I here found a genuine quartz pebble, about 2 inches in diameter, round and flat, with its edges broken a little on two opposite sides. This was the only specimen of a pebble that I saw in Florida, and I pronounced it a foreigner.

All of the marine shells which we saw at these South Florida shell-heaps corresponded with the live species now inhabiting the waters of that section. All of the stone implements or fragments, except the piece of soap-stone and quartz pebble before noted, corresponded with the limestone, or the lime fossil coral, or the silicified corals, &c., of that region, the latter, so far as I know, being found only in Hillsboro' Bay, and mostly at Ballast Point, about 5 miles below Tampa. In fact all of the arrow heads from South Florida that I have observed appear to have been made of material obtained at or near Ballast Point. Here are many silicified geodes, both large and small, some having an outer surface that shows a coral formation, while the inner surface is of various bright colors of chalcedony or drusy quartz. Here also are pieces of cherty flint of considerable size, which, when they have not been previously broken, are coated with limestone. The beach at low tide is literally covered with quartz that has been artificially broken. Many apparently unfinished implements are found, and also occasionally finished arrow heads, scrapers, &c. Arrow and spear heads were made from the thin flattish sides of geodes, so that the work was much more hazardous than making them from thicker stock. Cavities were numerous even in the best material found here, and presumably for that reason unfinished implements are very numerous in this vicinity. While in many places the beach abounds in stone, I have never known of any having been found, in nature, upon the inland surface.

A little back from the beach at Ballast Point is a long ridge of shells, much broken, as if washed up by the tide. There are, however (the facts before noted), plenty of evidences that this was ground formerly frequented by the Indians, and many believe this ridge of shells to be the remains of an Indian shell heap.

## ANCIENT EARTH-WORKS IN CHINA.

By Mark Williams, *of Kalgan, China.*

From Kalgan to Yŭcho are ancient mounds in cluster on the plain or singly on eminences. These latter would indicate signal towers, while the former would suggest tombs. They are about 30 feet high, circular and oval in shape, and no arrangement can be observed in the clusters.

At the base of a signal mound by the great wall of Kalgan I found a stone ax.

The Chinese give no rational explanation of these mounds. I have as yet found no mention of them in ancient records. At Yŭcho, 100 miles south of Kalgan, is a cluster of forty mounds; 4 miles off are ruins of a city wall. Chinese cities have rectangular walls, with towers at short intervals. But this is a circular embankment with no remains of towers. The part of the remaining entrance is unlike the gate of a Chinese city. Records state that this was the seat of a Chinese prince who lived B. C. 200. In some places the wall is levelled, in other places it is perfect, making an acute angle at the summit. Cultivation has narrowed the bases of the mounds, but superstition prevents their destruction. To one familiar with the works of the mound builders in the Mississippi Valley, the stone ax, the mounds, circular wall, suggest a similar race.

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## PLAN FOR AMERICAN ETHNOLOGICAL INVESTIGATION.

By the late Henry R. Schoolcraft.

[The following programme, though never officially adopted by the Smithsonian Institution, embodies the result of much study of the subject by the distinguished author; and even after the lapse of forty years possesses sufficient interest and suggestiveness to justify its publication.]

"*Plan for the investigation of American ethnology, to include the facts derived from other parts of the globe, and the eventual formation of a museum of antiquities and the peculiar fabrics of nations; and also the collection of a library of the philology of the world, manuscript and printed. Submitted to the Board of Regents of the Smithsonian Institution, at their first meeting, at Washington, in September*, 1846."

New York, *August* 22, 1846.

Gentlemen: In laying before you the following suggestions, I am governed by the opinion that there is a means of investigation of the subject proposed, which possesses general interest as a branch of human knowledge, and cannot but be invested with peculiar force to men of letters dwelling on the western continent. The origin, dispersion, and

affinities of nations, and their transference from the eastern to the western hemisphere, prior to the period of Columbus, have constituted subjects of interesting inquiry from the time of the discovery. And viewed in the lights which are now presented by the progress of ethnography, modern geographical discovery, and other means of advancing the study of nations, the inquiry may be supposed to be one which the mind of Mr. Smithson had embraced in his enlarged conception of promoting "the increase and diffusion of knowledge among men."

The occupation of the continent itself by men diverse—in their physical and mental traits and their languages, from the various races of its discoverers at and after 1492; separated as that continent is, by seas and open straits, from other parts of the globe, constitutes an interesting and unsolved problem. And its solution is still more interesting when we reflect that these native races had no maritime skill adequate to the construction of ships; that the state of arts, if we make some local exceptions, was very low; that they were without letters or literature; and, when questioned as to their origin, they put forth traditions which were generally better suited to engage the imagination than to satisfy the judgment.

The extent and noble proportions of the continent, stretching for thousands of miles along the Atlantic, and forming a vast and mountainous barrier between it and the Pacific, entitled it in more than one sense to the appellation it received by every succeeding navigator of the New World. It was indeed a new world, not less in its grand physical structure than for the races of man, who roved over rather than inhabited it. And these latter races, now that 354 years have passed, are quite as much a problem to historians and philosophers, in respect to their early connection and national affinities with the races of Asia, Africa, and Europe, as they were then.

But when we examine this continent in all its sweeping latitudes and longitudes, in its highest altitudes, and in its lowest and broadest valleys, we find imbedded in its very geological strata, as well as in its surface, ruins and other evidences that it had been inhabited long anterior to the Indian race,—that there had been people of diverse arts and habits upon its plains and estuaries. And that, of the red race itself, there are evidences of mutations and changes, reaching from mere sachemships to rude colossal empires, which, like that of Montezuma, broke down, in fact, under the glittering and disproportioned weight of their inherent corruptions and barbarisms.

Forts, mounds, ditches, and works of art, pottery with the triune emblem of the philosophy of Zoroaster, mummies wrapped in their half Nilotic cerements, vast pyramidal structures of earth and of stone, palaces and ruined cities, are among the objects of its antiquarian and historical interest. Not only from the romantic and sublime lake of Titicaca, and the fire-crowned peaks of the valley of Mexico, do we perceive centers of population, rushing out to rule and conquer, but from the yet

unexplored plains of the Rio Gila and the Colorado of California, from the broad valley of the Mississippi, from the southern slopes of the Appalachian range of the South Atlantic, and even from the colder latitudes of the Great Lakes, where the indomitable Iroquois built up their republic, we behold a concurring series of facts and discoveries which prove incontestably that various races of the wide-spread and original family of man have lived, and cultivated, and warred, and died at these localities.

When we come to apply to these vestiges of ancient structure the scrutiny of exact observation and description, and to view the facts under the lights of induction and historical analysis, we elicit several classes of evidence which tend to restore important links in the history of the original dispersion of our species, advance us in the scale of knowledge, and go far to enable us to appreciate and understand our position on the globe. And in proportion as this investigation is pressed, in proportion as science is applied to it, and the current of investigation deepened, we abstract from the boundaries of mystery and conjecture, and add to these of ascertained facts and history. We thus progress indeed in knowledge, and compass one of the noblest ends of being.

It is in this light that ethnology makes its appeal to modern letters; and I beg leave to bring its claim to your early consideration. It is proposed to consider ethnology in the most enlarged sense of which the etymology of the word admits as embracing man in his divisions into nations; their affinities and characteristics, mental and physical, with such proofs deduced from history, philology, antiquities, and the exact sciences, as may serve to link nation to nation, and race to race. In this study particular reference is designed to be had to the position of the American continent, and to the aboriginal races found upon it, when first discovered by Europeans. In this view, it will embrace not only geography, antiquities, and history, as descriptive sciences, but likewise the early history of arts, ethnography, comparative philology, geology, and physiology, and such other collateral sciences as may be found necessary to investigate, illustrate, and explain the subject.

The mode of advancing the subject, and carrying into effect the inquiry, so as best to bring out the facts for general information, may admit of some diversity of opinion. It is not an inquiry which admits of extempore results. To consider diligently the various parts of the continent which furnish aliment for the investigation, to scrutinize and collate what has been discovered and written, to collect from mounds and other sources, in various parts of the world, specimens of ancient art, and above all to embody the present and past philology of tribes and nations, is a labor requiring time and attention. Much of this, when acquired, is hardly of a character to sustain popular lectures. It may be doubted, indeed, whether in offering researches in a verbal form they are not always in danger of suffering from the hands of theory and rhetoric. Still, it is a question whether condensed statements of parts

of the inquiry may not thus occasionally be thrown out. But whether so or not, the inquiries should be printed at a press owned and controlled by the board, and in a form to correspond with the general style and plan of their publications. In what manner compensations should be awarded, and whether by a temporary appointment or a fixed professorship, having a residence at the parent Institution, and the benefit of its library and collections, in the various departments, may admit of consideration. One remark may however be confidently added, that without adequate provision for the time, books, and travel incident to the inquiry, no person can be expected to enter upon effective labor in this field.

Outlines of the study are sketched in the following synopsis.

### (I.) OBJECTS OF INQUIRY.

1. *Physical type of man, or physiological traits by which the several races of men may be distinguished.*

(*a*) *Ethnographical position on the globe.*—Tribes; nations. (*Wiseman.*) Generic groups. (*Blumenbach, Pritchard.*)

### 2. *Material existence.*

(*a*) *Means of subsistence.*—In the hunter state: (Zea maize, roots and fruits, flesh of animals;) Ichthyophagi: (Coast-tribes, crustaceans, fish. What species?) Herdsmen: (Gens des roche, gens des large.) Agriculturists: (What plants cultivated? how? and by whom? what agricultural tools? Cotton-plant; tobacco; potato.) Concurrent facts in natural history.

(*b*) *Mechanical arts: skill.*—Clothing: skins: bark: hemp-plant; hunting implements; arms; implements of public games; fishing implements: nets: fish-hooks: bone-needles; navigation; vessels: native cordage; utensils for preparing food: knives: pots; potter's art: What condition? vessels of clay—raised by hand or on the wheel? boiling. How effected, where no clay pots? Metallurgy. What facts? Axe of stone, of copper. Trees, how felled? baskets: twine: awls, of bone or horn; pipes of clay, of stone; art of dyeing.

(*c*) *Architecture.*—Dwellings, how made; tools in reference thereto; sculpture; painting; monuments of stone, of earth; temples; roads; bridges; teocalli; mounds; idols; baths; fountains; sepulchres.

### (3) *Intellectual existence.*

(*a*) *Languages spoken and written.*

(*b*) *Geographical names.*

(*c*) *Picture writing.*—Hieroglyphics; wampum belts; quippus; inscriptions.

(*d*) *Arithmetic.*—Units: mode and limits of computation; decimal system; vigesimal mode; high numbers, how denoted.

(*e*) *Measure and division of time.*—Day, month, year; astronomical facts; chronology, how denoted; measure of length; capacity; value, (currency.)

(*f*) *Social state and government.*—Civil institutions; political phenomena; laws, penal and civil; marriage; distinctions of rank; castes; clans, chieftainships; descent of titles and rights; totemic principle, how extensive; condition of females; marital rights to property.

(*g*) *Religious belief and institutions.*—Ideas of the Deity; priesthood, how organized; prophets; jossakeeds; metas; nature of worships; fire worship, how spread; demonology; guardian spirits; compensations for *sin;* sacrifices; feasting; fasting; dreams; dancing.

(*h*) *Music and poetry.*—Musical instruments; music boards; mnemonic songs, by symbolic annotation; rhymes, any; war chants; pictorial rolls and devices.

(*i*) *Oral tales and legends.*—Historical fictions; allegories; fables; tales of amusement; concurrent proofs of imagination (*Algic researches*).

(*k*) *Medical knowledge.*—Lancet; cupping; pathology of diseases; magic, as applied to medicine and hunting; botanical remedies; metallic; knowledge of anatomy, what; theory of the circulation of the blood.

(*l*) *Mythology.*—Persian; Egyptian; Chinese; Grecian (*Bryant*); Roman; American.

(*m*) *Philosophy of life, death, and immortality.*—Ancient cosmogony; notions of creation; deluge; monster-era; transformations; metempsychosis; state of the dead; ghosts; witchcraft; idea of vampires.

(4) *Geographical phenomena as affecting or modifying the physical type and the material and intellectual existence.*

Climate; interior or seaboard position; natural productions, as affecting physical development; tropical and torrid zones; influence of the polar latitudes; meteorology and topography generally; effects of snow and ice on the physical type, as in the Eskimo.

## (II) MEANS OF ASCERTAINING THE FACTS.

### 1. *Antiquities and existing monuments.*

(*a*) *Remains of art.*—Buildings; antique excavations; caves; tumuli; pyramids; teocalli; military works, ditches, moats, &c.; columns; arms; the arch, how developed; mechanical tools, of stone, lead, copper; the lever and wedge; idols; sarcophagi; mosaics; bricks, art of making, traced; pottery, how developed; gems and other ornaments; has glass ever been found in American ruins of the ancient period?

(*b*) *Proofs of mental development in the fine arts and composition.*—Laws of proportion in architecture; painting; statuary and sculpture; picture writing; hieroglyphics; phonetic signs; dawning of the alphabet; oral tales and traditionary lore; inscriptions.

2. *Existing intellectual evidences of generic groups.*

(*a*) In vocabularies; (*b*) dictionaries; (*c*) grammars; (*d*) plan of utterance; (*e*) names of places. (Antique.)

3. *Physiology.*

(*a*) Skulls; (*b*) mummies; (*c*) osteological remains.

4. *Historical relations and works.*

(*a*) Works ascribed to natives, as in Mexico; (*b*) works by Europeans; (*c*) missionary translations, &c., modern period; (*d*) authentic traditions of all ages and countries. (Recorded.)

5. *Natural History.*

(*a*) Changes the earth and animated nature have undergone, as denoted by embedded bones; (*b*) what effects have taken place in the superincumbent formations since the existence of mammalia; (*c*) how deep in the geological column can the existence of man be traced; (*d*) general reflex character of geology on the topic.

6. *Mythology, as a proof of mental affiliation in remote and barbarous races.*

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In reference to all the objects, it is essential to compare the several American nations one with another, and with the leading nations of other parts of the globe. In proceeding to explore the subject, the first labor must be that of accumulating facts. Visits to the several objects of antiquarian interest demanding attention, with proper instruments for observation, are required. Field surveys of ruins, and drawings of all important objects to be commented on, are essential. Care must be taken to notice whether there be more than one era of occupancy, or one type of nationality, denoted by the same locality. And with the same view the different ages and relative position of the different geological formations, embracing ruins, or objects of art, should be carefully noted. Fossil bones of extinct or ancient species of animals, and beds or banks of shells of the Eocene or Pliocene deposits, furnish the character of evidence denoting separate epochs of occupancy, and become invested with new interest. Traces of organic life of the higher species have been found deeper down in the geological column, in later days, than were known to the elder geologists, and the vestiges of man should be carefully sought in all the unconsolidated strata. We know the globe has been disturbed since its creation and destruction, and we should be prepared to find physical evidences of it. Not only architect-

ure, but metallurgy, pottery, sculpture, and drawing should be interrogated, in examining their remains, on American soil. Inscriptions on rocks are of value, as antiquarian proofs, as well as all traces of the ancient method of symbol or picture writing.

But whatever degree of care is evinced by personal inspection, it is essential to the purposes of comparison that a full and complete collection of antiquarian objects, and the characteristic fabrics of nations, existing and ancient, should be formed and deposited in the Institution. By adding to this, from time to time, such implements of art or war, articles of costume, or other objects of curiosity, as might be obtained, there would be formed, in the end, a museum of mankind, wherein each tribe and nation would be characteristically represented. Such a museum would, in itself, be a desideratum.*

Nothing is more characteristic of the intellectual existence of man than language. It is found to be a more enduring monument of ancient affinities than the physical type, and there is no tribe however situated from whom this proof of affiliation should not be obtained. By collecting a vocabulary and grammar of every known tongue, from printed and verbal sources, the Institution would present to the world a library of philology which would cause its site to be resorted to from the remotest quarters. In the United States and British North America alone we have at least sixty-four dialects and languages.† Nor should the mythology of rude nations be neglected. It is the frame-work of their philosophy and their religion, and gives character to their songs and poetry and every form of intellectual excitement.

Finally, both the duty of observation in the field, and the examination of facts and evidences in the cabinet or library, may be commenced immediately, and need not be delayed until the contemplated buildings are completed, and other parts of the library, &c., perfected. Time is essential in making preliminary examinations. The consideration of the country may be taken up in a separate and systematic manner, taking valley by valley, or State by State. Some portions of the land are more prominent in their claims to notice than others; but in all over which the tide of modern emigration sets, the evidences of its former occupation are rapidly disappearing. The same may be said of the Red Race, whose language and customs it is wished to preserve. The earlier the labor is done, the more easy will be its execution. In the Mississippi Valley alone, where so many evidences of the earliest and heaviest ancient population exist, but a few years will place the most important facts beyond our reach. By adopting the plan suggested, or some plan of this nature, we shall rescue from the oblivion of past generations matter for thought and reflection for the future. As fast as the infor-

* Many valuable objects of this kind have been brought home by the exploring expedition, and are now deposited in the Patent Office.

† Gallatin, Am. Ant. Col., Vol. 2.

mation is collected, digested, and prepared, it can be submitted to the public. Whatever form for diffusing it the Board may through its committees adopt can be conformed to; and in this way the object may at once be made to assume a practical cast.

In submitting this plan, which has been hastily sketched, and expressing at the same time the interest he feels personally therein, the undersigned begs leave to subscribe himself,

With high respect, gentlemen, your obedient servant,

HENRY R. SCHOOLCRAFT.

# PART II.

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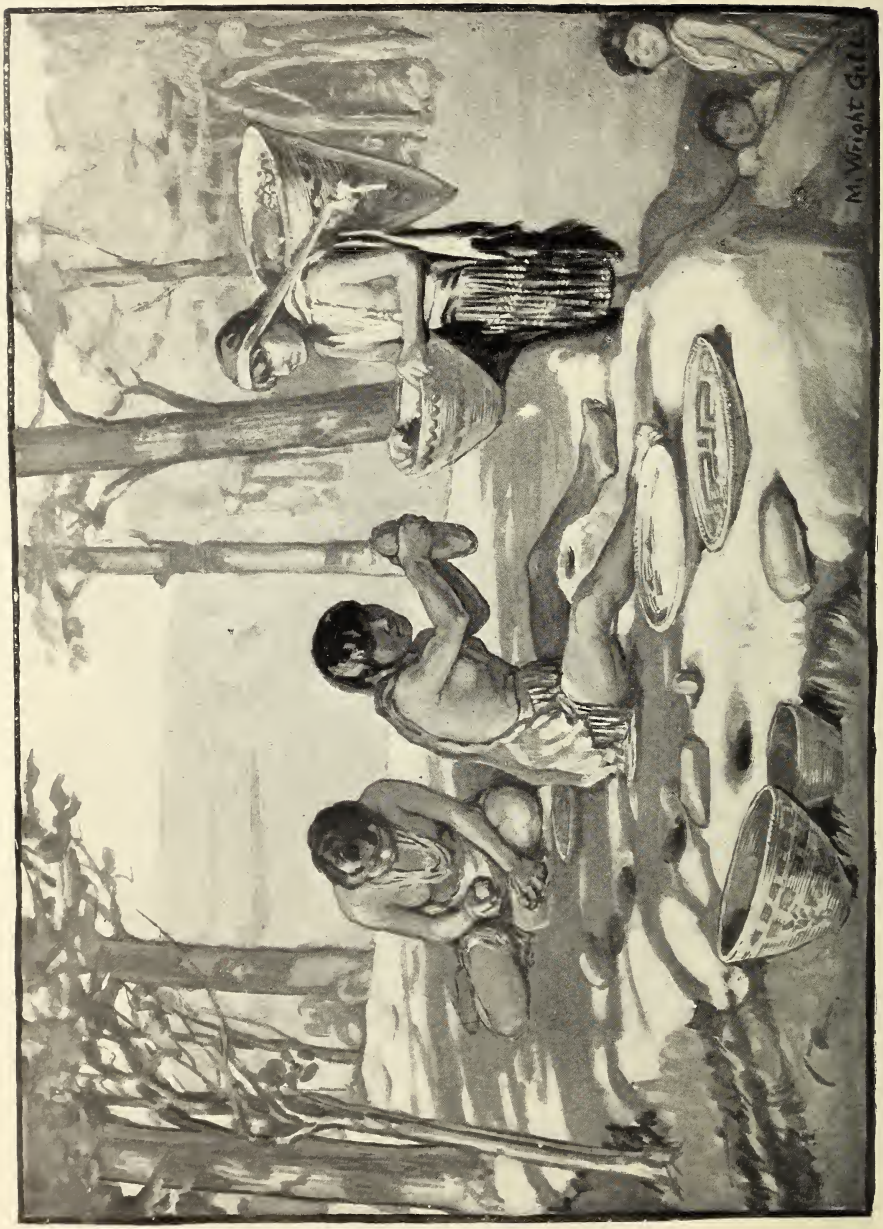


MILLING PLACE OF THE CALIFORNIA INDIANS. PRIMITIVE COSTUMES.

# ANTHROPOLOGICAL STUDIES IN CALIFORNIA.

BY

**WILLIAM HENRY HOLMES,**

*Head Curator, Department of Anthropology.*

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# ANTHROPOLOGICAL STUDIES IN CALIFORNIA.

By William Henry Holmes,
*Head Curator, Department of Anthropology.*

## INTRODUCTION.

It is not intended in the present paper to enter into a systematic discussion of Californian archæology and ethnology, but rather to present such materials as it has been my good fortune to acquire during a brief period of exploration, mainly in the central portions of the State.[1] In order that these observations may have, in a measure, the proper setting, a few introductory remarks in explanation of general anthropological conditions on the Pacific coast are presented.

In considering the archæology of a great region like California, it is proper that the present aborigines and their culture should be studied, and the knowledge thus acquired utilized in discussing the prehistoric monuments and artifacts of the region. To-day there are remnants of many tribes in California, at least twenty separate linguistic stocks being represented, a really marvelous diversity in a province which, howsoever extensive (some 300 by 800 miles in extent), is not separated into very well-defined areas by orographic or other barriers. As laid down in colors on the map, the remarkable multiplicity of stocks along the Pacific coast is especially noticeable, and it seems as if the varied ethnic elements of a vast region must have been attracted, one after another, to these lowland and coastal valleys by some powerful magnet, such, for example, as that furnished by an unfailing food supply; and so formidable are the barriers of mountain ranges on the east and

[1] The observations recorded in these pages were made during a brief trip to California in the summer of 1898. The work was conducted under the auspices of the Bureau of American Ethnology, and the writer was accompanied during the major part of the journey by Dr. W J McGee, ethnologist in charge of the Bureau. One of the principal objects of the journey was to look into the evidence relating to the antiquity of man in the Auriferous Gravel region of the Sierra Nevada. This subject has already received attention in a paper published in the American Anthropologist for January and October, 1899, and reprinted with additions in the Smithsonian Report for 1900, and will not be presented at length in this connection.

so forbidding the deserts on the south, that few communities once settled along the coast would ever take the trouble to seek homes elsewhere. It would seem that the nations were caught as fish in a trap. The way in was easy, but the way out was hard. By some such process California acquired its varied peoples. The remarkable diversity in language is thus probably largely due to the arrival of tribes already speaking diversified tongues rather than to differentiation within present habitats.

Notwithstanding the great multiplicity of languages there is marked uniformity in the physical characters of the people, and culture in general is diversified only in details. We conclude that although the peoples had a common origin, no doubt in the far north, scattering and isolated occupation of vast areas of country led to multiplication of tongues, while all those elements of culture dependent upon immediate environment and readily modified by it have been remodeled into a homogeneous whole. It is probable that conditions nearly identical with those of historic times have prevailed for a long period on the Pacific coast. Archæology seems to have no strong light to throw upon the history of the region. We seek in vain for the presence of distinct peoples or indications of different conditions. We can neither trace any of the present peoples back along the course of their history to more primitive conditions, nor follow them in their migrations far outward into regions from which they may have come. There is nothing in the past of culture that is not comprised in the present. There may have been simpler peoples, less advanced peoples, in the near or far past, but there is no trace of former higher development or the coming of strangers bearing with them germs of strange cultures from foreign lands, northern or southern, Asiatic, European, or Polynesian.

We observe, also, that in its ensemble Californian culture is sharply marked off even from that of most of the neighboring peoples—as, for example, the Pueblos, the Mound-Builders, and the Mexicans. Art in stone, upon which archæology must largely depend, is practically uniform at all points in the California province, differences being due largely to variations in local resources. The absence of certain forms of implements and utensils common elsewhere is especially noteworthy. There are no grooved axes[1] and no celts, past or present. Sculpture of life forms is almost wholly absent, and building in stone was and is unknown. At the same time many of the classes of artifacts found in California are peculiar to the region. The mortar and the pestle are most notable features of the domestic outfit of the coast, and though, in one form or another, present in many sections of America, are nowhere so prevalent and so varied in shape. The grinding plate and

[1] An exception is found in the grooved implement, illustrated in the seventh volume of the Surveys West of the One Hundredth Meridian, p. 203.

muller are almost equally numerous, and it is probably to the acorn that the region owes the remarkable development of these utensils; and the wide distribution of the oak tree over the slope in a measure regulates the distribution of the tribes, tending to foster a very general but rather scattering occupation by small communities. It is thus that the tribes have always been but slightly associated and wholly without the ability to unite in concerted action.

Simultaneously with the development of the mortar and grinding plate there grew up the art of olla or stone vessel making, and the discovery of extensive deposits of soapstone on the far-away island of Santa Catalina led to a new and distinctive group of artifacts confined to the channel islands and the neighboring coastal districts.

A most notable peculiarity of the art of the region is the rarity of earthenware, which for some undiscovered reason was never utilized, save in the making of rude balls of baked clay for use in slings and in sporadic efforts at vessel making. The rude earthen vases found in the Tulare region and elsewhere are probably mainly of recent origin, and the practice of the art by the mission tribes of the South is no doubt a late Shoshonean transfer from the Colorado Valley. Utensils of stone and wood occupied the field covered by pottery in other sections, and basketry grew into unexampled importance, displaying remarkably varied phases of form, technique, and embellishment.

Sea shells, which abound along the entire coast, and especially the haliotis and the clam, have furnished material for personal ornaments and helped to determine their character, and the great deposits of obsidian toward the north have probably given an impetus to flaked stone art among all the tribes.

We might expect at first glance to find dividing lines, more or less distinct, between the peoples of the south and those of the north, and between those of the Sierra belt on the east, the chain of valleys traversing the middle of the State from north to south, and the coastal zone, but the differences are not of great importance, as no barrier exists to prevent free intercourse between neighboring sections. The north has evidently been affected by the farther north, but the south has hardly felt the influence of the more advanced tribes of the Colorado Valley.

That the peoples are of Asiatic origin I see no reason to doubt, but to speak of them as Chinese, Malay, or Tartar in origin, without very considerable qualification, is a great mistake. Although all may have arrived, more or less directly, from the north, and primarily from the shores of Bering Sea and beyond, it is not likely that any particular Asiatic strain ever passed the north Pacific arch, ran the gauntlet of interfering and opposing nations, and reached far-away California in even approximate purity. That any particular language of the many

existing in temperate Asia should be preserved throughout the centuries of migration and struggle and appear in California so unchanged as to be identified with a given Asiatic tongue to-day is not to be expected, and it is manifest folly to continue the search for traces of Asiatic arts and industries other than those that may have been transferred in recent times by means of modern ships. Every art, save the most elementary, would be lost or transformed in passing the frigid gateway. Religion, social institutions, government, industries, all would change with changing conditions and be remodeled in each of the numerous distinctive environments encountered between Tartary and California. Agriculture, pastoral arts, metallurgy, ceramics, and all forms of domestic art would be obliterated, and other activities, such as weaving, stone-shaping, house-building, hunting, and fishing, would be so completely modified that no knowledge of original practices would remain in the mind of any individual or be preserved in any tradition. What is now found, old or new, in the culture of California, is America's own, if not, indeed, fully and absolutely Californian. The incoming populations of the coast had to discover the metals, and could not have developed the arts of using them until ages after reaching the temperate zone. Clay existed everywhere in plenty, but tribes arriving from the far north would be slow to discover its use in the arts and cast aside inherited arctic forms of utensils. It has not yet in any part of the coast usurped the place of skin, bark, and wood in vessel making, although neighboring provinces on the east and south have been potters for many centuries. Before soapstone came into use it had to be found in far out of the way places; and the group of milling arts, now so important a feature in the economy of the people, had no prototypes in the frigid zone, where the diet was exclusively animal. It would be useless even to guess at the time required for the development of the group of arts and industries characterizing the aboriginal culture of California.

Study of analogies in blood and culture, with the view of establishing more than the most general relationships between American and transoceanic nations, has been and no doubt will be quite in vain. The question of a possible very ancient autochthonic people is sometimes raised, but as yet there is apparently no sufficient basis upon which to discuss the proposition. If there were such people in America they must now be merged fully into the Asiatic populations of the present period. The same would be true also of the culture. We may well pursue the study of Californian archæology with practical certainty that, whatever the origin of the people, we are, in the main, elucidating local and sublocal culture. With language it is different. Although changing rapidly with altered conditions, speech has little tendency toward uniformity among distinct nations. Twenty peoples coming from different regions to California, bringing as many distinct

languages, might still speak twenty different languages after the other activities had been modified and remodeled as in a common mold by the local environment.

## VICINITY OF NEVADA CITY, NEVADA COUNTY.

The first stop of our party in California was at Nevada City, Nevada County. Here archæological investigations were made and collections of basketry and stone implements were secured from some families of "Hi-eet" Indians (Pujunan stock), whose village is on the table-land about a mile west of the city. A recent fire had deprived these poor people of their wooden houses, and they were lodging in improvised shelters, brooding over their misfortunes. There are hardly more than a dozen individuals, all told. They are not, however, ill favored and debased in appearance, and compare very well with other tribes of corresponding condition and habits. The men work in the mines or at other occupations when opportunity offers, and the women gather acorns—still a large factor in their domestic life—grind them in the stone mills, and prepare the food; they also continue to make baskets in the usual style of the Sierra tribes. It is not pleasant for the ethnologist to note, however, that the gunnysack is taking the place of the strongly woven carrying basket, that the iron pestle and muller are superseding those of stone, and that cooking on iron stoves and in tin utensils is being substituted for the old-time stone-boiling in tightly woven baskets.

Several milling places were found near the dwellings, where convenient masses of granite happened to be exposed. A dozen conical depressions, some shallow and some deep, were scattered over the rock surfaces, and all about were the mealing stones, some nearly round, others oval, flattish, or cylindrical, a few well shaped, the others rude. Some were suited for grinding by abrasion, others by pounding, the shape being accommodated to the contour of the depression in which they were to be used. These milling places are usually covered by a rude pole and brush shelter, which serves to protect from sun and rain the women (Plate 1), who spend much of their time at the mills. Besides the fixed mortars, there were seen about the dwellings both round and flattish mortars and mealing stones, with accompanying pestles and mullers used in the minor pulverizing work of the household. Illustrations of typical forms from neighboring districts are given farther on. The archæological features of the vicinity are referred to in the paper, already mentioned, devoted to evidences of auriferous gravel man. It was observed that in particular the modern villagers dwelt above the brinks of the great mines, and that stray artifacts necessarily found their way into the excavations. Search was made for the mine from which one of the specimens, a mortar, referred to by Josiah D. Whitney in his work on the Auriferous Gravels of

California, is said to have come, and it was ascertained that this mine was confined to a small gulch, at the head of which stands an oak grove suited in every way for occupation by the acorn-using natives of the district.

Nevada City is picturesquely situated on the banks of a mountain torrent known as Deer Creek, and evidences of former mining activity are visible on all hands. The gravels occur in extensive deposits, and though rich in gold are not yet nearly worked out, the enactment of laws limiting the use of water for hydraulic operations having greatly retarded the work.

## VICINITY OF FOREST HILL, PLACER COUNTY.

From Nevada City it is a day's journey to Forest Hill, the county seat of Placer County—a great mining center in former days. The trip was made by rail to Colfax, on the Central Pacific R. R., and thence by stage coach across the magnificent canyon of the North Fork of American River. These Sierra valleys are all of absorbing interest to the student of human history, for it is held by many that man inhabited this region long before the vast gorges began to be excavated, and the grand ranges culminating in the snow-capped Sierra began to be carved out. As our coach crept wearily up the eastern rim of the valley, and, long after nightfall, passed out over the crest through the mining town of Yankee Jim, 2,000 feet above the river behind us, we for the first time realized the full significance and magnitude of the proposition advocated by Whitney, namely, that human bones and relics of advanced culture occur in large numbers in the original formations of these mountain crests—formations laid down in the stream beds of a river system already obliterated in Tertiary times, and long before the erosion of the present valleys began. The particular object of our visit to this district was to learn something of the possible origin of the objects of art reported by Whitney as coming from the mines, and at the same time to collect from the native villages scattered over the district such objects of interest for the ethnologist as the people possessed.

The village of Yankee Jim is located on the brink or rim of the great valley of the North Fork of the American, and Forest Hill, 2 miles farther on across the plateau-like crest, overlooks the superb valley of Middle Fork. Professor Whitney says,[1] on the authority of Mr. C. D. Voy, that stone implements were found in 1864, about a mile south of the town of Forest Hill, at a depth in the gold-bearing gravels of about 10 feet. One of the most interesting of these was a flat dish, or platter, worked out of hard granite, and about 18 inches in diameter. We at once sought out those residents of the locality

[1] J. D. Whitney, Auriferous Gravels, p. 272.

best qualified to inform us regarding the mines and their history, and were so fortunate as to meet Mr. Richard Clark, a well-known citizen and extensive mine owner, who had been in the district from the very beginning. It was soon learned that the great Dardanelles mine, owned and worked by Mr. Clark, was about 1 mile south of the village, and in his company the site was at once visited. The mine occurs several hundred feet down the slope descending into the canyon of the Middle Fork, and on a narrow bench called Oro Flat. Here the outcropping margin of the gravel deposits of a Tertiary river channel are exposed in a heavy deposit 200 to 400 feet thick. The mining operations destroyed a large part of the flat, leaving at the upper margin, when active work ceased ten years ago, an irregular gravel cliff half a mile long, exposing the full thickness of the gravels now considerably weathered down and gullied by erosion. Approaching from above, we descended to the flat and halted upon a rounded portion of the surface overlooking the brink of the mine. Here was a small farm, and a field immediately above the deepest part of the mine was quite bare, although it had not been cultivated apparently for some years. It was soon discovered that the spot had been extensively occupied by the native peoples, and in the course of the forenoon a dozen mealing stones and mortars (Plate 2), thirty hand stones and pestles (Plate 3), and many minor relics—mainly arrow and spear points—were collected. It was noticed that the outer margin of the site had been encroached upon by the mine and perhaps a third or half of it had been destroyed. It was further seen that the site slopes toward the vertical brink of the mine, and that many gullies are cut, growing deeper toward the cliff, and that near the margin they are so deep and precipitous that it was unsafe to enter them. The relics were found all over the field, but more abundantly in the gullies where they had rolled and lodged; but all were surely on their way to the mine. Naturally, only the smaller, flatter objects remained, the round pestles and the globular mortars had long since found their way into the mine below, where they became intermingled with the great mass of loose gravels and bowlders. Some specimens were found far down the sides of the mine lodged on ledges and in heaps of débris, and the fact was impressed upon our minds that finds of stone relics in the mine, unless made by expert observers, could have no value as an index of age. On the brink of the mine were found also conical mortar basins worked in the surface of large bowlders and outcropping rocks. Mr. Clark assured us that this site had not been occupied by the natives since the opening of the mine in 1852, and it is clear that as the mining work went on all along the lower margin of this site the stone implements rolled in, and it is no wonder that collectors were able to secure from it the flat dish or platter of granite referred to by Whitney, for a dozen of these objects were still scattered along the brink

above ready to fall in as the work of the miner advanced. Plates 2 and 3 illustrate part of the finds made on this spot. It is observed that these relics do not correspond fully with those of the modern Indian sites, that the mullers are smaller and rounder and more neatly shaped, and that the smaller stone objects are of varieties not now in use. This, however, does not necessarily indicate different peoples, but probably results from changes in habits due to contact with the whites and the degeneracy of aboriginal work in general.

At Yankee Jim, at one time a very lively camp, but now a small village, we visited a mine being opened by Mr. Robert Clark, and spent an hour at an Indian dwelling on the hill slope near the mine. The photograph of a dismantled mill shown in Plate 4 *a*, was secured at this place. The shallow mortars, similar to those shown in Plate 2, were sunk in the ground so that they can just be distinguished in the picture. The hand stones consisted of several rather rudely shaped ovoid and cylindrical stones (Plate 4 *b*), a small, oblong, flattish grinding stone pecked away at one end to make it available as a pestle, and three or four iron wagon-axle pestles. Some of these hand stones evidently served both for pounding and rubbing, while one or two are slightly concave on one side, indicating their use also for cracking acorns upon or as mortars for pulverizing in a small way. The fact that some of the mortars and grinding plates of California are well rounded and finished on the margins and base while others are rude and unfinished has been noted by several writers, but I do not recall mention of the fact that the unfinished ones are intended for planting in the ground, leaving only the concave grinding surface exposed, while the finished ones, at least those of smaller size, are portable household utensils. What ethnical significance there may be in this is not determined. The differences in form may be due to the presence of distinct peoples on the site, or to diversity in the practices of a single people at the same or at different times.

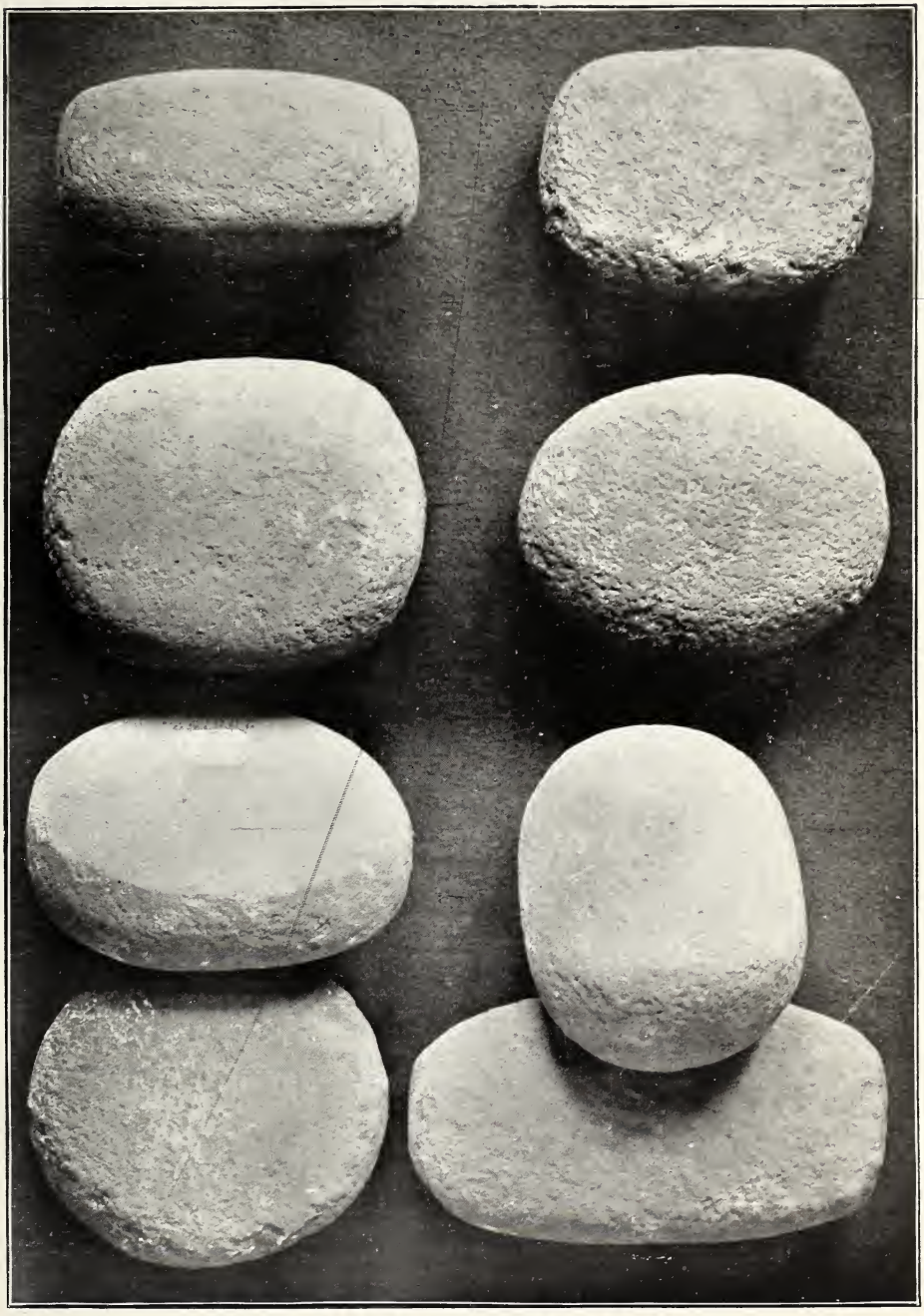
Learning of an Indian settlement in Todd's Valley, 4 miles south of Forest Hill, we drove down and spent a day in the vicinity. Here also we found extensive gravel mines, similarly situated to those at Oro Flat, and native settlements in intimate association with them. The residence of an Indian family stands on the very brink of the mine, and doubtless the site has been long occupied.

While Dr. McGee was engaged in his usual occupation of securing vocabularies and hints of the customs and history of the people, I looked into their milling places and learned what I could of their arts. The principal dwelling is a frame house of two or three rooms and a porch, while about are the mill house and other simple shelters. An elderly woman, Susan by name (her native name could not be learned from any source), having tattoo marks on her chin, had near at hand a very snug little shelter made of sticks, bark, and foliage, in which

Diameter $15\frac{3}{4}$ inches.

Diameter $7\frac{1}{2}$ inches. Diameter $7\frac{1}{4}$ inches.

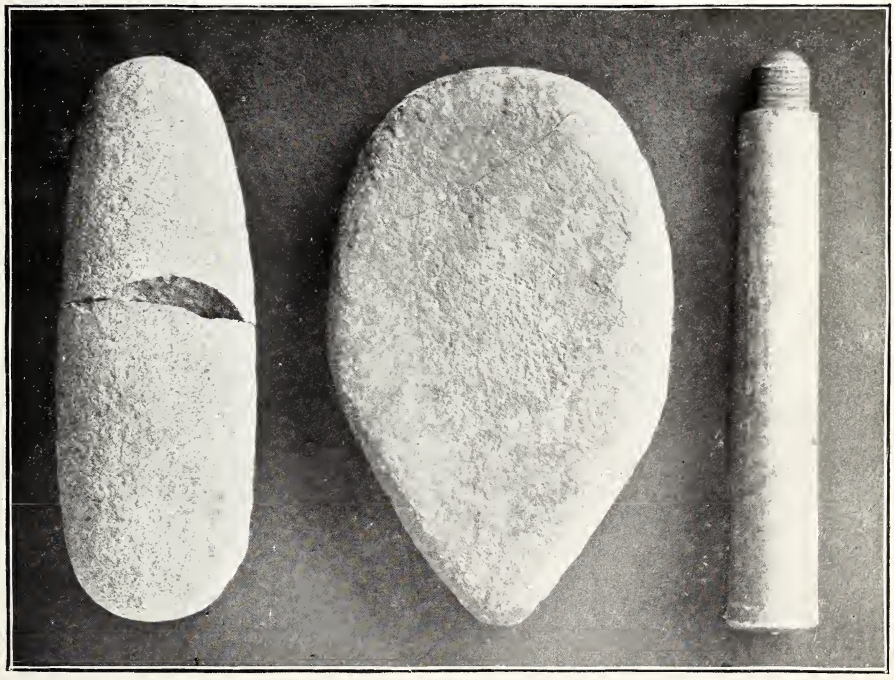
STONE MEALING PLATES, ORO FLAT.



STONES FOR RUBBING AND POUNDING, ORO FLAT.

About one-half actual size.

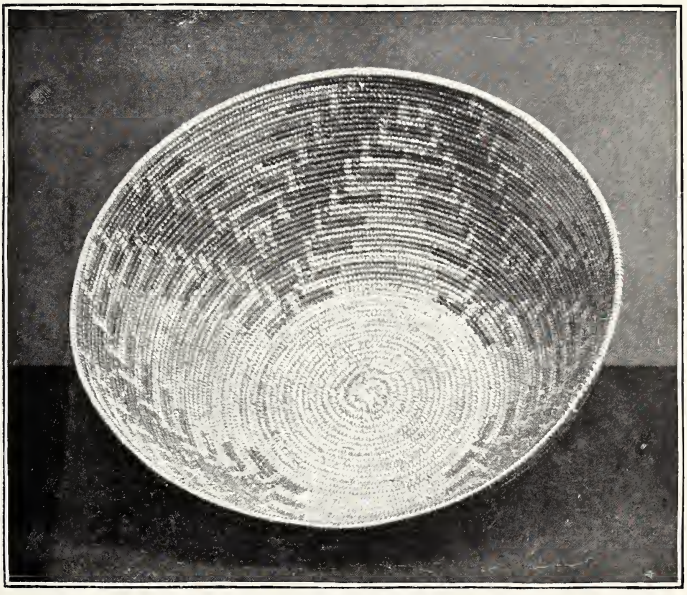
*A.* DISMANTLED MILLING PLACE, YANKEE JIM.



*B.* STONE PESTLE, POUNDING-GRINDING STONE, AND WAGON-AXLE PESTLE, YANKEE JIM.

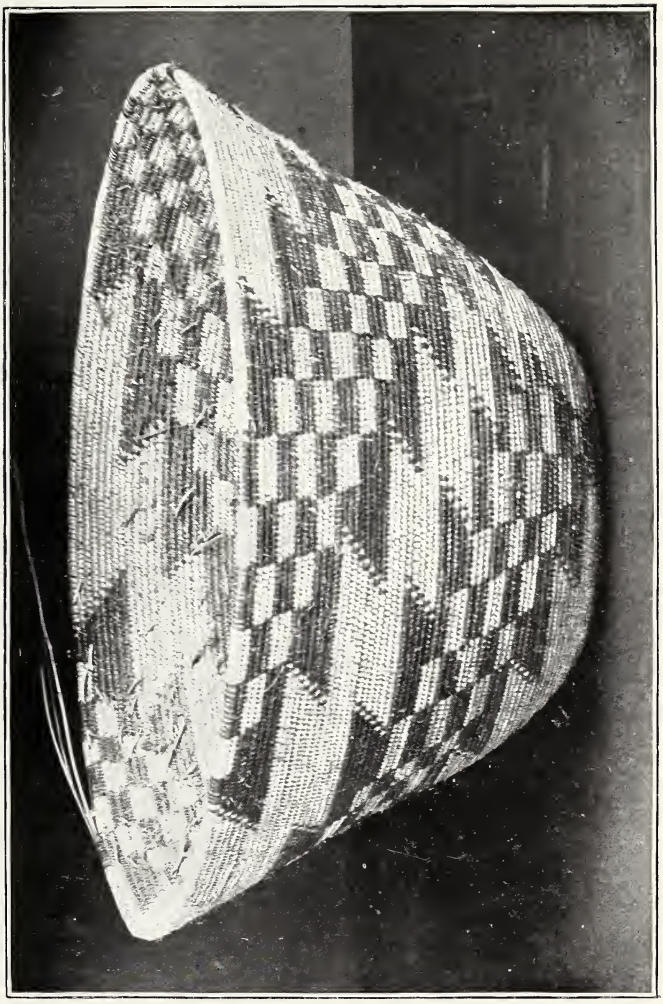
Length about 12 inches.

Diameter $9\frac{1}{2}$ inches.

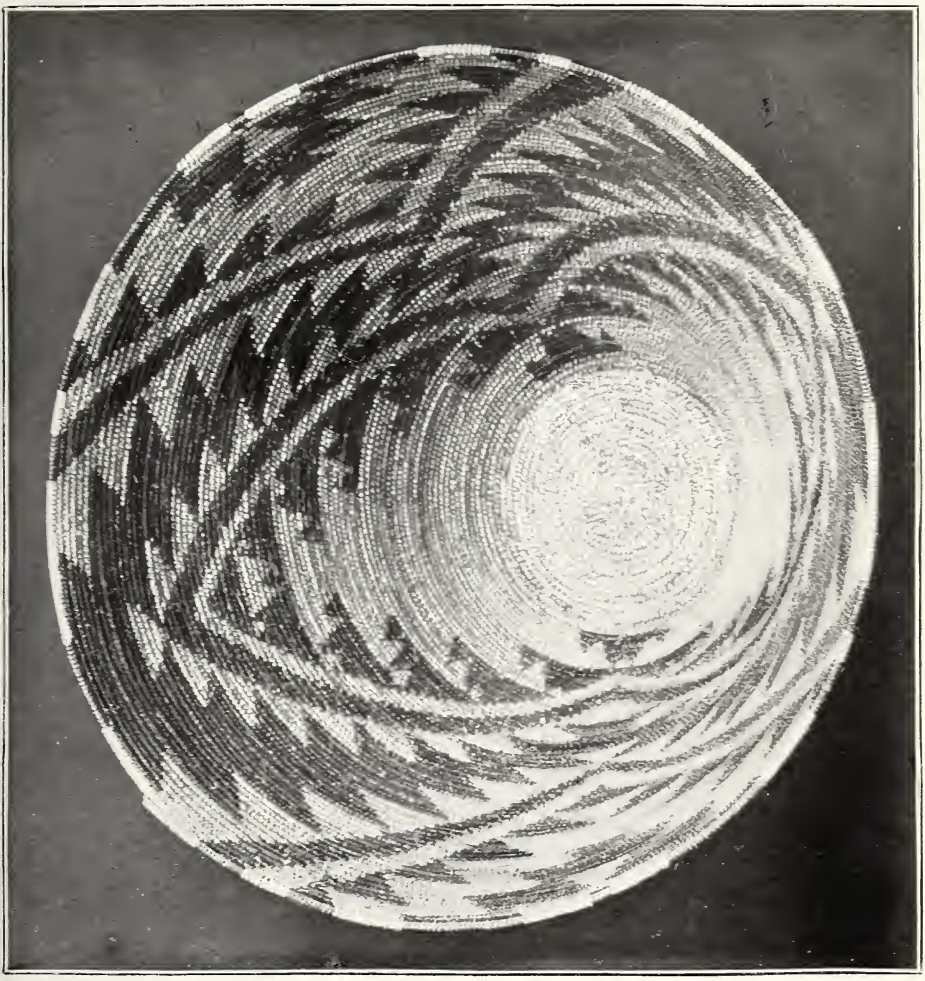


Diameter $11\frac{1}{2}$ inches.

BASKETS, TODDS VALLEY INDIANS.



UNFINISHED BASKET, TODDS VALLEY INDIANS.
Diameter 17 inches.



BASKET, TODDS VALLEY INDIANS.

Diameter 18½ inches.

she lived and carried on her share of the family drudgery. She ground acorns on a flat stone disk set in the ground near the middle of her shelter, and by the side of this was a slight depression in the hard earth used as a hearth. She boiled the porridge outside by heating small stones in an open fire and lifting them into the cooking baskets with a pair of neatly trimmed and pointed pine sticks about 5 feet in length. When the water was boiled the stones were removed with other sticks, and when the porridge became somewhat firm it was dipped out with a cup into another basket and was ready for use. This food was not at all unpalatable, as it had been deprived of the bitter taste of the acorn by leaching. This process consists in scooping out a depression in a bed of sand, into which the meal is poured and soaked with water until the bitterness is absorbed by the sand. The gruel is then taken up and is ready for cooking. The baskets used were of excellent make and tastefully ornamented. By dint of long bargaining and insisting we were able to secure half a dozen examples of the good woman's handiwork. Some of these are shown in Plates 5, 6, and 7. They are typical specimens of the basketry of this portion of California, and seem to combine some of the characteristics of the basket work of the surrounding tribes. They are new, and we were quite unable to buy the baskets in present use. We were shown one feather-decorated piece, said to have been made by an aunt of the young woman of the household at some distant point. It was valued very highly, having been a gift, and we could not secure it. It was stated that the use of feathers was not common among the American River tribes. Some of their carrying baskets and the gleaning paddles and meal-fanning trays, they informed us, were of Paiute make.

A very interesting mealing outfit was encountered on the hillside above the dwelling and near the margin of the mine. It had been deserted for some time, but the poles of the shelter were still in place. There were four or five shallow mortars worked on the surface of a rock even with the surrounding ground, and sixteen hand stones, comprising numerous shapes ranging from a flat ovoid rubbing stone to a well-formed and symmetric pestle. We were also shown an acorn-cracking outfit, consisting of a small round stone with a shallow pit on the upper surface for resting the acorn and a globular stone for striking. The acorn is set on end to receive the blow. Stones of various shapes are used, according to the supply on hand, and in the absence of suitable stones the cracking is done with the teeth. Details of the grinding and other operations are given a little farther on.

On the bottom of the mine, 200 feet beneath the spot occupied by the mealing place just described, we found a large stone having a deep conical mortar on one side. It had evidently fallen in from above, and had probably escaped the attention of seekers after evidence of Tertiary man.

The dwelling of Porter, the headman of the small group of native families in this vicinity, is a short distance below the mine. It is of rude construction, and is distinguished from the ordinary dwellings by its circular shape and radiating clapboard roof. Similar houses were encountered in Calaveras County, and an illustration is given in Plate 8. They are probably the communal or council houses, or survivals of these.

## TUOLUMNE TABLE MOUNTAIN REGION.

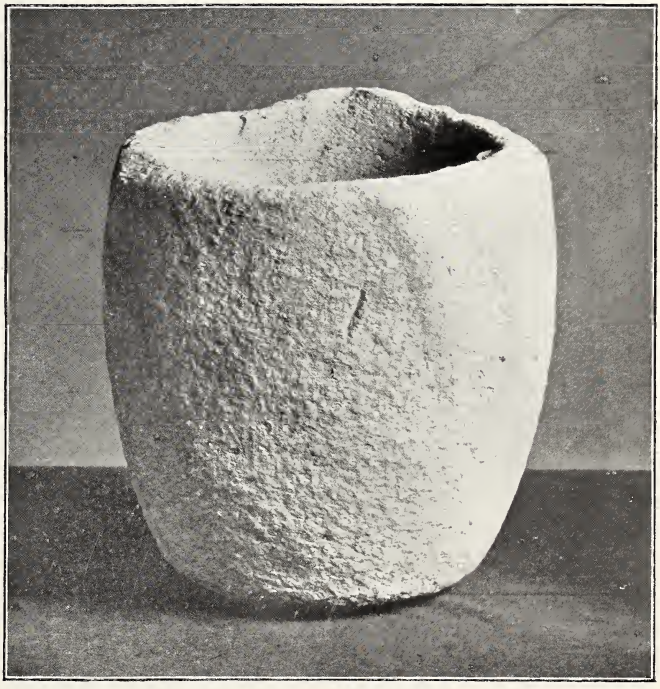
From Forest Hill we returned to Colfax, and were soon in San Francisco. From this place visits were made to other points of interest. Another excursion to the auriferous gravel region was made, by way of Stockton, Oakdale, and Jamestown. At Jamestown we were within easy reach of many interesting points ethnologically and archæologically. This district includes Tuolumne Table Mountain and the mining towns of Sonora, Murphys, and Angels, and has furnished much of the testimony upon which the theory of an auriferous gravel man has been supported. In recent centuries it has been occupied by a numerous population of the Sierra tribes. The finds in the auriferous gravels are fully discussed in a paper already referred to, and I need here mention them but casually, giving chief attention to the remnants of native population scattered here and there in small bands over the hills and along the valleys. Half a mile south of Jamestown we encountered a small aboriginal community occupying half a dozen houses, built in the main of sawed lumber and fairly comfortable. The people were carrying on the usual acorn industry, using utensils of native make and grinding and preparing the meal in the native way, but otherwise showing many indications of contact with the whites.

A second community of like character and proportions was located a mile to the west, on the slopes of Table Mountain. These people showed indications of thrift, and their simple arts were carried on under the shade of their own vine and fig tree. One man, exhibiting traces of negro blood, and having a wife quite half white, was engaged in rounding the ends of the shingles to be used in giving an ornamental effect to the walls of his house. It is said that in this district, when the mines were being extensively worked and a large white population filled the country, there were also large numbers of Indians gathered on the outskirts of the towns, ten or a hundred times more than are found in the vicinity at the present time.

Ancient village sites are numerous, and old native burial places are common. At Springfield, 10 miles north of Jamestown, an old miner named John Cannon had two well-shaped globular mortars in his back yard. These were so highly valued by Mrs. Cannon as receptacles for watering the chickens that we had difficulty in securing one

NATIVE VILLAGE AT MURPHYS.

SHELTER FOR SUMMER USE, NEAR MURPHYS.



STONE MORTARS FROM STANISLAUS AND MOKELUMNE VALLEYS.

Diameter of each 10½ inches.

of them (Plate 9*a*). Mr. Cannon stated that he found them several years ago in a mine on Mormon Creek near by. They were embedded in auriferous gravels 5 or 6 feet deep, and at the same place, but a little deeper, he uncovered a number of skeletons, accompanied by various relics—implements of stone and ornaments of shell. That the burials were comparatively recent is indicated by the fact that the hair of the scalps was well preserved. From Patrick Shine, a little farther on, I secured a flattish, plate-like mortar, some 8 inches in diameter and of usual type, that he declared had been obtained from a mine on his place at a depth of 80 feet.

Old village sites were found at Saw Mill Flat, 8 miles northeast of Jamestown, on the brink of a deserted mine, and at the entrance to the tunnel of Montezuma mine, on Table Mountain, 3 miles southwest of Jamestown. Near Columbia, which was a great mining center in the early days, there is a large granite outcrop, exhibiting a considerable group of mortars of the usual form, sunk in the surface.

The journey from Jamestown to Murphys and Angels gave us the opportunity of crossing the valley of the Stanislaus at two points—Robinson and Parrott ferries—and the impression made on our minds by the gorge of the American Fork was strengthened by the experience. The proposition necessarily entertained by believers in auriferous gravel man that these vast valleys with their lofty and wide-spreading walls have been eroded within the human period seems too preposterous to be entertained. The descents are made by well-kept roads, but the way is long and often precipitous, and the scenery is exceedingly impressive.

On the plateau beyond the canyon the limestone belt begins, and as a result canyons, caverns, and natural bridges are common. Near Murphys a visit was made to Mercer's cave, which is entered by a contracted irregular opening descending almost vertically and expanding into a series of irregular crevice-like chambers, the result of the solution of a particular limestone stratum by underground waters. Through the appreciative courtesy of Mr. W. J. Mercer we were able to examine the cavern and to dig for human remains in the débris directly beneath the opening. A few fragments only were found, but Mr. Mercer had previously secured some skulls and other portions of skeletons. They were not old and were not coated with calcareous matter, having been buried but a short time in the loose earth which had fallen in from the opening. One of these skulls was presented to the U. S. National Museum by Mr. Mercer, and the result of an examination by Dr. George A. Dorsey shows that it resembles very closely the so-called Calaveras skull of Whitney.[1]

At a considerable depth, and not directly beneath the opening, we were shown portions of a skeleton of some large animal. Some frag-

[1]Smithsonian Report, 1899, p. 465.

ments were secured and examined by Mr. F. A. Lucas, of the U. S. National Museum, who found them to belong to a gigantic sloth, one of the Tertiary Mylodons. Mr. Mercer says that about 2 miles beyond the cavern there is a burial pit from which he previously obtained human bones and obsidian implements.

On the partially wooded ridge overlooking Murphys on the north and within half a mile of the cave, we came upon an Indian village, comprising half a dozen dwelling houses and the usual accompaniment of summer shelters and milling places. Two of the houses are shown in Plate 8. They are round and upward of 25 feet in diameter. The walls are formed of planks and the roof is covered with clapboards radiating from a conical, shingled chimney. The framework is of poles and the construction does not differ essentially from that of the aboriginal round-house of many tribes. The men and women all appeared to be busy with domestic affairs, the work being conducted in a large roofed structure, open at the sides; and in a little conical shelter made of sticks and brush, on the slope below the village, we found two old women pounding acorns.

In one of the houses was quite a store of basketry, some of the pieces evidently homemade, but others the work of the Paiute and other neighboring tribes. Within the group of houses was an interesting granary—a tall wattlework receptacle resting upon a stem of wood and further supported by four marginal poles. Its purpose was no doubt to place the crop of acorns, corn, or other food material beyond the reach of rats and pigs.

A single family, the remnant of a larger community, is located on the Adams place, a little to the eastward of the village of Murphys, and a small village was encountered on the road from Vallecito to Angels, a few miles south of Murphys. Here I procured some photographs of a rather comely Indian woman engaged in the arduous task of grinding acorns, her interesting family of three children entering prominently into the pictures (Plates 12 and 13). Plates 10 and 11 serve to illustrate two of the first steps in the acorn industry, the carrying and hulling of the acorns, and the use of the mealing plate in grinding. The upper view in Plate 12 shows the miller as she sits over the crater-like cone of pulverized acorns with the heavy pestle raised in front of her face. As the pestle descends into the center of the heap, spreading it out over the margin of the mortar, one hand or the other is freed and deftly rakes the meal toward the center of the stone again and joins the other hand to raise the stone, the whole movement being so rapid that there is no pause in the operation of pounding. The shallow mortar, formed of a flattish stone, is planted in the ground even with the surface, and the meal spreads out on the firmly-impacted soil. The basket receptacle for the meal, covered with the fanning basket tray, is at her right hand, and the children, engaged in play,

CARRYING AND HULLING ACORNS.

GRINDING ACORN MEAL ON STONE PLATE.

*A*. POUNDING ACORNS IN MORTAR.

*B*. SIFTING THE MEAL—SEPARATING THE COARSE PARTICLES BY SHAKING.

*A.* REMOVING COARSE PARTICLES FROM EDGE OF BASKET.

*B.* RESTING FROM THE WORK.

*A.* CLEANING THE MEAL BY SHAKING AND BLOWING.

*B.* POURING MEAL INTO SAND BED FOR LEACHING.

*A.* LIFTING HOT STONES INTO BASKET OF WATER.

*B.* REMOVING STONES FROM BASKET OF WATER.

are on her left. Two mealing stones are seen in the foreground, which combine the functions and shape of both muller and pestle. The ends are used as a pestle for pulverizing (Plate 12 *a*), and the slightly flattish sides are fashioned for rubbing (Plate 11). In the lower picture (Plate 12 *b*), the woman is engaged in tossing the meal in the fanning basket, separating the husks and brushing them off at one side. The partially filled basket of meal is seen on her right. In the upper picture (Plate 13) the meal has been nearly all cleaned up and the basket receptacle is well filled with the fine flour. In the lower picture (Plate 13) a curious change has come over the scene. By some misadventure the woman became conscious of the fact that the visitors were taking her picture and ceased to work, appearing frightened, for they all seem to know what the little black kodak box means and seriously object to being photographed. As a rule it was unsafe to show the camera among these people, for in a moment there would be a general disappearance and a necessary cessation of friendly communication and trade. Behind the miller in the last picture two stone mortars may be seen set in the ground. Formerly there was a considerable group of milling stones here, but at the time of our visit the shelter had been removed and the mill had apparently been for some time neglected.

I introduce here four other pictures, illustrating successive steps in the work of preparing the acorns for food. The upper view, Plate 14*a*, shows the process of clearing the meal of chaff by tossing and blowing. Plate 14*b* is intended to illustrate the process of leaching the meal in a bed of sand. The boiling in baskets is shown in Plate 15, *a* and *b*.

The houses in this rancheria, three or four in number, are built, as usual, of slab walls and clapboard roofs. The lower view, Plate 8, shows one of the brush shelters or summer houses under which the family sits and most of the domestic work is carried on. Here, as elsewhere, there is a distressing admixture of tinware, ovens, etc., with the native utensils. The only man seen in the place was a strong, swarthy individual, who took no notice whatever of the visitors, being absorbed in the task of filing a crosscut saw.

## COLLECTIONS IN SAN FRANCISCO AND VICINITY.

There are many collections of archæological and ethnological objects in California, but altogether they inadequately represent the rich field so conveniently at hand. There has been little systematic collection, and a splendid opportunity has been lost. The vast accumulations of wealth for which the coast is noted have accrued to those who had no appreciation of the native history of the coast or who lacked the public spirit to endow museums. The future Californian will realize this more fully and regretfully than the Californian of to-day.[1]

[1] Fortunately the statement here made is no longer true. Subsequent to the stereotyping of this paper it is announced that Mrs. Phoebe Hearst has provided liberally for anthropological researches, to be under the direction of the University of California.

In San Francisco the Golden Gate Museum has acquired considerable material, portions of which are well identified and of value to science, but Curator Wilcomb has not been able to give any considerable time or funds to collection. The Academy of Sciences also has a large collection, but so heterogeneous in character and so deficient in associated data as to be of no great anthropological value. Private collectors have done good work in limited fields, and I refer with pleasure to the very valuable collection of baskets brought together by Mr. and Mrs. C. F. Briggs.

The State University at Berkeley has not attempted to acquire collections, but has had placed in its care a large number of stone implements and utensils brought together by Mr. C. D. Voy and attributed in the main to the auriferous gravels of the central districts of the State.[1] The Stanford University has made a very creditable effort to gather and preserve the precious relics of native art, but so far has not been able to enlist the services of curators competent to give the collections standing as scientific material.[2] Such collections as I was able to examine in other parts of the State are referred to in connection with notes relating to the localities to which they pertain.

## POMO RESERVATION, MENDOCINO COUNTY.

From San Francisco a run was made north to Ukiah, in Mendocino County, the chief object being to pay a visit to Dr. J. W. Hudson and have a look at his collection of basketry, reputed to be one of the finest in the West. While at Ukiah we had the opportunity of visiting two villages of the Pomo Indians (Kulanapan linguistic family), who are among the most interesting tribes of the region. Their dwellings are roughly constructed of frame and weatherboarding, and must be comparatively comfortable, save in severe winter weather. Little trace is seen of aboriginal construction or modes of life. The ruin of a large earth lodge, used formerly for ceremonial purposes, is found in one of the villages. It is illustrated in Plates 16 and 17.

The people have not entirely lost their nomadic habits, and at certain seasons wander in small bands along the rivers and over the mountains, hunting, fishing, and gathering fruits and seeds, carrying their possessions on their backs, and putting up simple brush shelters for protection against the weather.

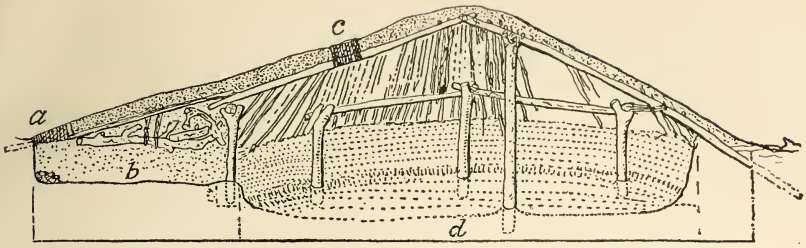
These Indians are past masters in basket making, and Doctor Hudson, in his twenty years of practice in the vicinity and his frequent visits to the villages, has had exceptional opportunities for making

[1] I have to acknowledge the kind assistance of Professor J. C. Merriam, curator of the State University collections, in my study of these relics.

[2] To Prof. John C. Branner, of this institution, I am greatly indebted for data relating to the auriferous gravel finds.

UNDERGROUND COUNCIL CHAMBER, POMO VILLAGE.

From photograph by Dr. J. W. Hudson.

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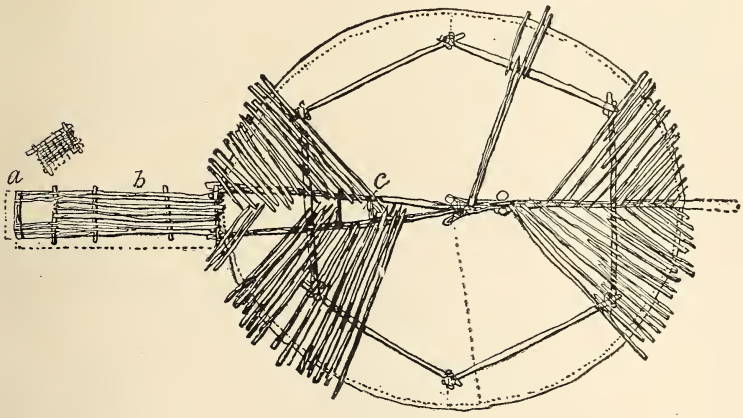


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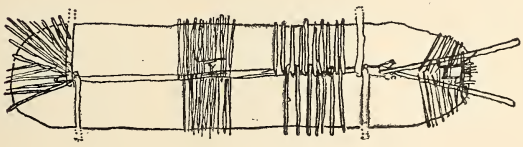

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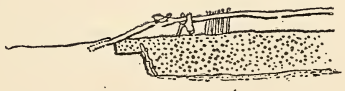


4

CONSTRUCTION OF POMO BUILDINGS.

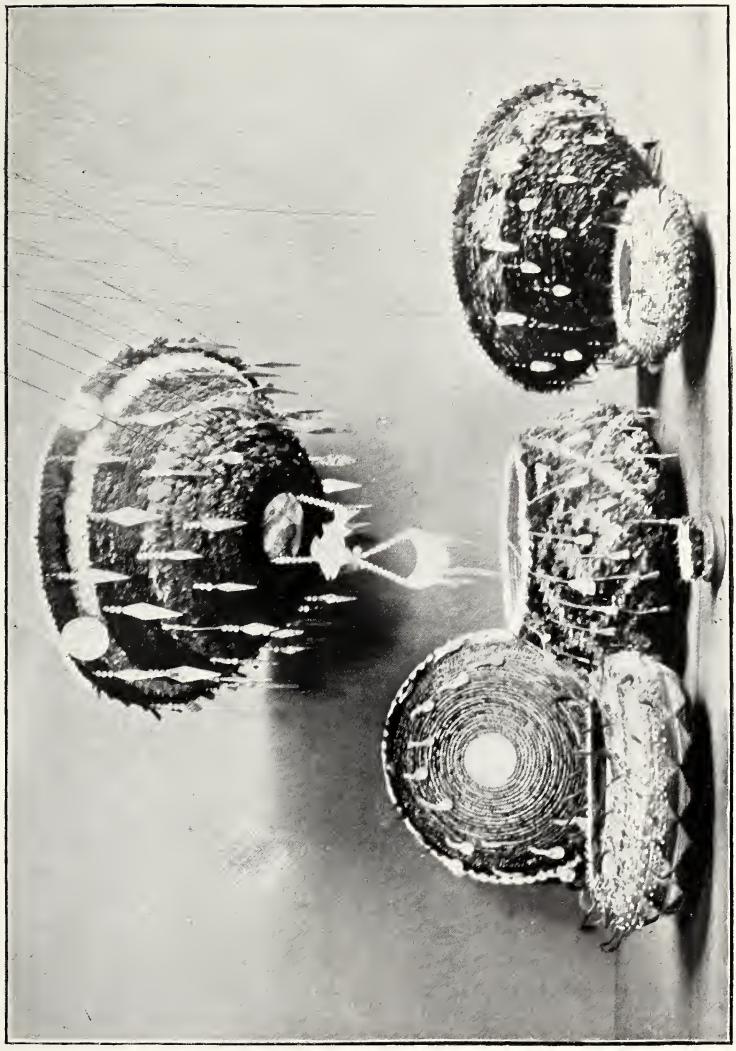
1, Section of ceremonial chamber, length 40 feet; 2, horizontal projection of ceremonial chamber; 3, construction of hiberna for women, length 24 feet; 4, 5, sections of 3.
Drawn by Dr. J. W. Hudson.

CARRYING BASKETS OF THE POMO INDIANS.

Diameter of near basket 23 inches.

FEATHER-DECORATED BASKETS OF THE POMO INDIANS.

Diameter of buck basket 18½ inches.



FEATHER-DECORATED BASKETS OF THE POMO INDIANS.

Diameter of hanging basket 13½ inches.

A. POMO WOMAN MAKING A BASKET. PRIMITIVE COSTUME.

B. POMO MEN MAKING SHELL BEADS—GRINDING AND DRILLING. PRIMITIVE COSTUME.

A. POMO WOMAN WITH CARRYING BASKET.

B. POMO WOMAN POUNDING ACORNS IN MORTAR WITH BASKET HOPPER. PRIMITIVE COSTUME.

collections. He has gathered only choice pieces, and among these are many feather-decorated specimens of exceptional beauty. Arrangements were made for securing this collection for the Smithsonian Institution, and before the end of the year it was forwarded to Washington. I will not attempt to describe it, leaving that pleasant task to Professor Mason, who has made minute studies of that branch of native art, and, with the help of the carefully prepared notes of Doctor Hudson, a valuable contribution may be expected. In Plates 18, 19, and 20 a few notable specimens are shown. They serve for comparison with the Sierra Indian and Tulare work, illustrated in other portions of this paper.

I was interested in watching the women making baskets, Plate 21 *a*, and the men grinding and drilling clam-shell wampun, Plate 21 *b*. These people rely very largely on the acorn for their food, and the carrying basket, Plate 22 *a*, and the mortar and pestle, Plate 22 *b*, are constantly in evidence. The drawings represent the people in their native costumes, which have, however, been superseded in recent years by trousers and calico gowns.

The following interesting notes, furnished Professor Mason by Doctor Hudson, relate to Pomo bread making, dress, and forms of the drill:

Indian corn, or maize, is not indigenous west of the Sierra Mountains, and is not and never was used by our "Diggers." Acorns, buckeyes, and weed seed (about twenty-five varieties), notably the tar weed (*Madaria sp.*), also berries of a number of plants, especially manzanita (*Arctostaphylos tomentosa*), madrona, wild rose, and mountain laurel, are their staples, important in the order mentioned. Teuni bread is made of any of the eight varieties of acorns—Nuci, from *Quercus agrifolia*, and Tsupa, from *Quercus densiflora*, being valued as the sweetest. The nuts are sun dried, then hulled, then reduced to flour by the stone pestle and basket mortar, and cleaned by frequent siftings. A shallow pit is made in fine sand and pressed smooth with the hands; the meal is poured in and covered with leaves of iris (*Iris macrosiphon*). Fresh water is then poured on in quantities and the meal is stirred until it is thoroughly leached. Within an hour it can be gently lifted out in large pieces. Another pit is prepared for the oven, in which a fierce fire is started; stones the size of a smoothing iron are thrown in and, when very hot, half of them are taken out. The remainder form a griddle in the coals and are covered with wet leaves, oak and iris, on which the dough, which is the acorn meal mixed with 5 per cent of Masil, or red earth in solution; also sometimes the same amount of tar weed meal, Mako, is evenly spread. Wet leaves are placed over this; then the hot stones; then about 6 inches of earth. In six or eight hours the oven is opened, disclosing a large, flat cake incrusted in leaves, and smelling somewhat like bread. The Masil, or red ceremonial yeast, has given a dark-red cast, while the Mako turns it almost black. The taste is not unpleasant. It is flavored with an impure salt gathered either on the coast or at a spring on Eel River.

Buckeye Disa: The nuts are roasted in hot rocks, hulled and peeled with a deer-rib knife, then mashed in a basket with a heavy billet, like a giant potato masher, Disapawohai, then leached as above, and in the form of paste eaten hot or cold.

Pinole (Spanish) or To-o is a mush of acorn meal, leached of course, mixed with a percentage of other seed meals, boiled in a Tee or Bamtoosh basket by dropping hot

round stones into it until the contents are cooked. It has the consistency of mush, and is quite insipid. Wheat is now often substituted. It is toasted in a plaque with live coals, then mortared out into flour and cooked as above.

Other cakes are Mako, Malalkato, Bimu, named from constituents and methods of preparing. Yuhu is a coarse, unpalatable cake made from acorns (*Quercus wislizeni*).

All of the above except the wheaten cakes are of ancient origin.

The ordinary aboriginal dress of a man was a skirt, Kauxi, of the bark of a willow (*Salix nigra*), or of bulrush stems shredded. A mantle of skin, panther preferred, is tied over the shoulders and belted at the waist. A thick chaplet of mountain laurel covers the head. The woman has a deerskin mantle or chemise above and the Kauxi below; the head is usually bare. She sits generally on a tule mat at her work; the man kneels when drilling wampum, or at like labor.

The pump drill was introduced into Ukiah Valley by a Spaniard in the early seventies, and was carried into Potter Valley about the year 1876 by old blind George, now living. The aboriginal tool was called Dawihai (da win, to bore, hai, a stick), and was a straight shaft of wood, 2 feet long and half an inch in diameter at the middle [twirled between the palms of the hands]. The drill point was of jasper or flint, and fastened to the shaft by a lashing of hemp (*Apocynum cannabinum*), and coated with pitch. Its origin is beyond tradition.

## STOCKTON DISTRICT.

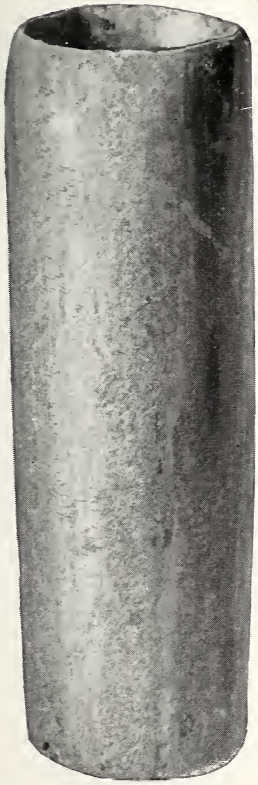
Early reports on the antiquities of California somewhat casually mention the occurrence of mounds in various parts of the State. Later investigations have furnished definite knowledge of the shell mounds and kitchen-middens along the coast, and of the earthworks in the interior valleys. Quite recently a new chapter has been added to the history of aboriginal California as a result of researches among the mounds of the great inland basins, including the valleys of the Sacramento and San Joaquin rivers and the basins of Tulare Lake and Kern River. These earthworks were erected by a much simpler and less ambitious people than the mound-builders of the Mississippi Valley. They are scattered over the low lands, mainly in the tule flats, where annual inundations are or were common. They are not arranged in any systematic order and show none of the specialization of form characterizing the mounds of the east or of Mexico and Central America on the south. They are roundish in outline and rarely more than 10 or 12 feet in height, although a few are reported to reach 20 feet; the profiles are gently rounded as a result of the crumbling nature of the earth of which they are composed (Plate 23 *a*), and the area covered is often quite extensive. It appears that in the main they were erected primarily for domiciliary purposes and as places of retreat in time of overflow. They were also used as burial places, though probably not originally erected for this purpose, and a few are literally filled with human remains (Plate 23 *b*).

The exceptional environment furnished by these interior valleys has evidently given rise to a somewhat peculiar phase of local culture,

*A.* MOUND NEAR STOCKTON.

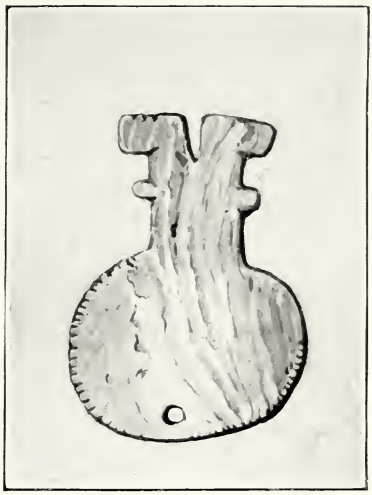
*B.* EXPOSURE OF SKELETONS IN MOUND, STOCKTON.

From photographs by Mr. H. C. Meredith.



*A.* CYLINDRICAL STEATITE VESSEL, FROM STOCKTON MOUNDS.

Barr collection.

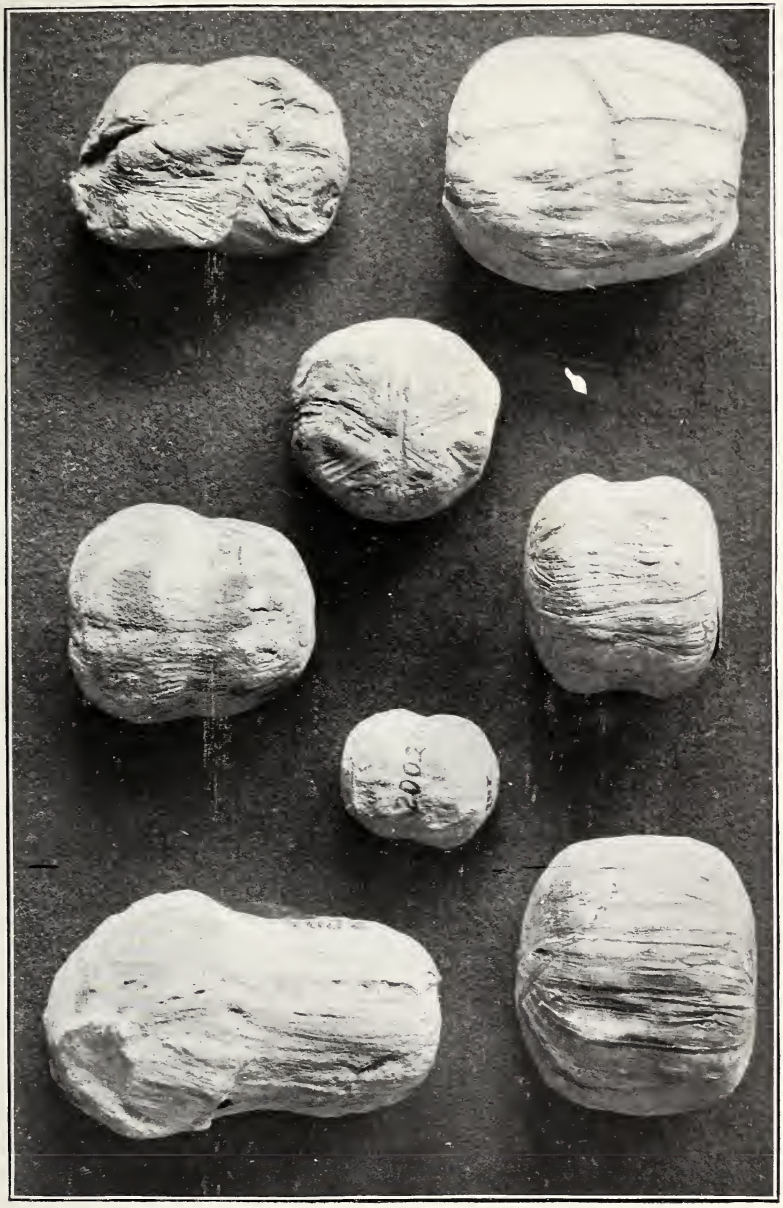


*B.* SHELL ORNAMENTS, FROM STOCKTON MOUNDS.

Barr collection.

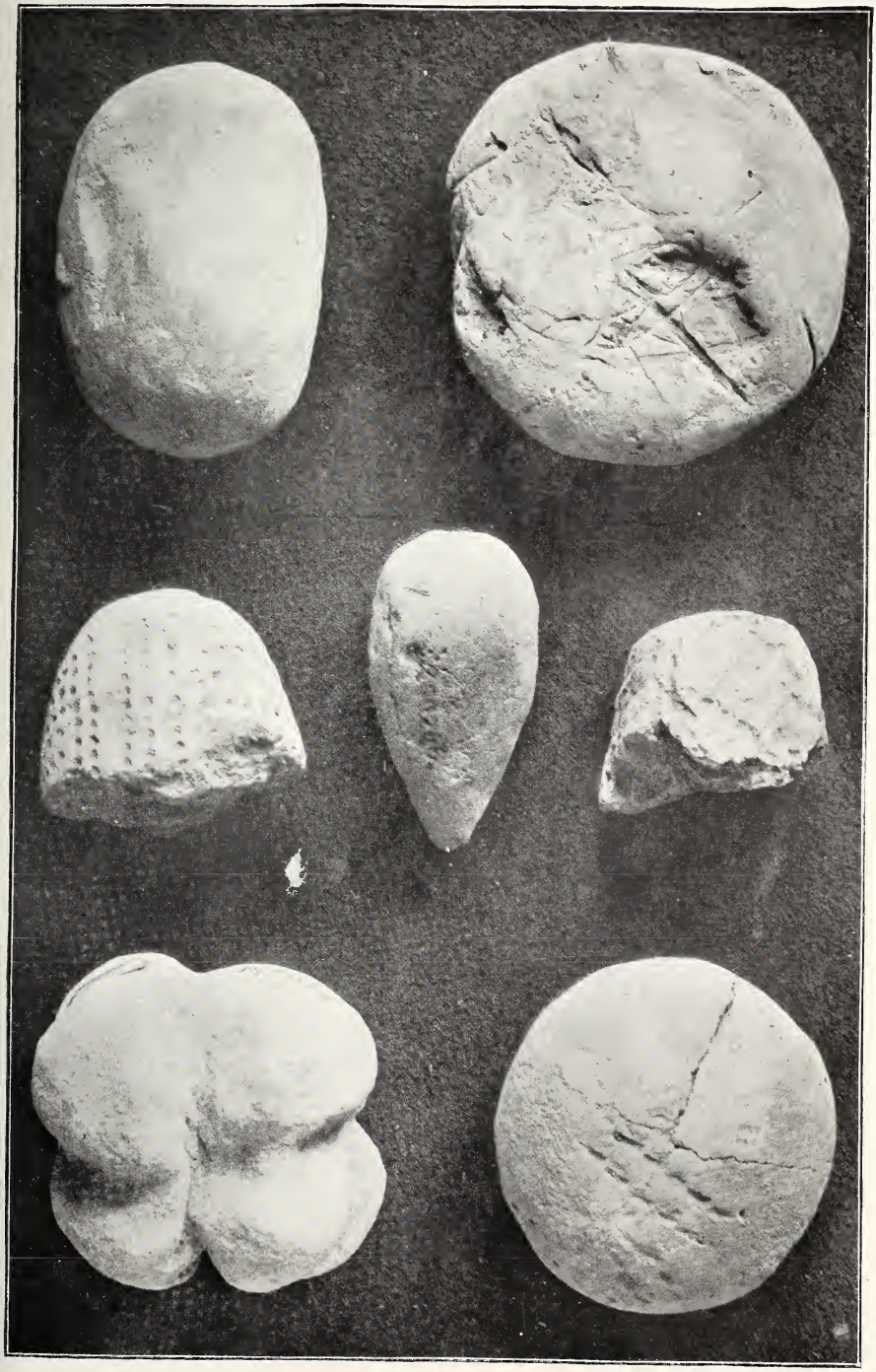
OBSIDIAN KNIVES, FROM STOCKTON MOUNDS.

Barr collection.



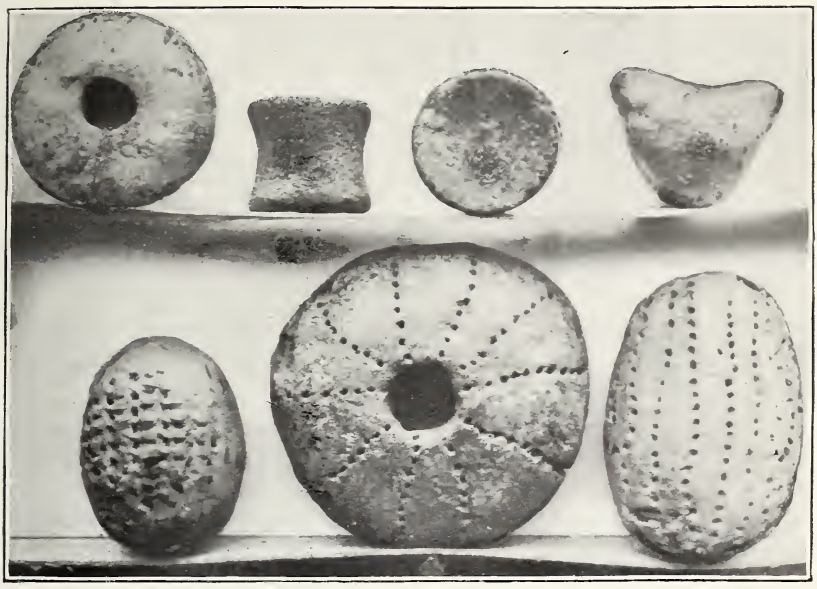
CLAY PELLETS FOR USE IN SLINGS, STOCKTON MOUNDS.

About three-fourths actual size.

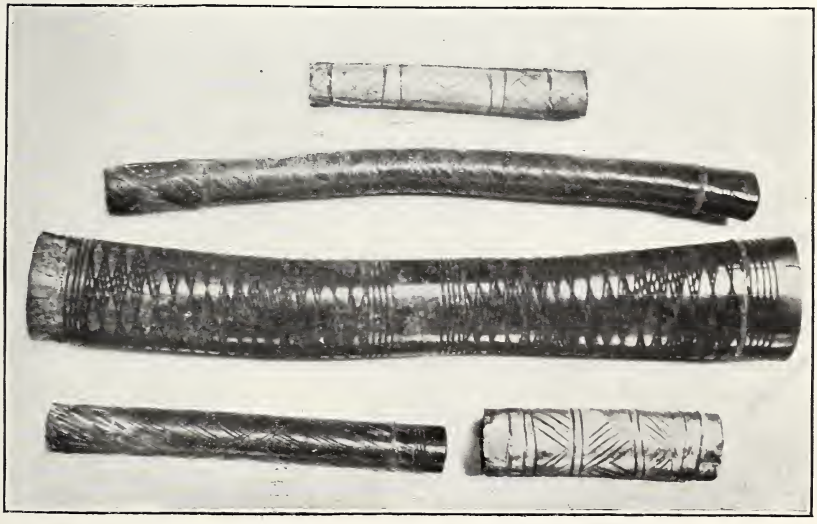


CLAY PELLETS FOR USE IN SLINGS, STOCKTON MOUNDS.

About three-fourths actual size.



*A.* CLAY PELLETS AND ORNAMENTS, STOCKTON MOUNDS.



*B.* DECORATED BONE IMPLEMENTS, STOCKTON MOUNDS.

Meredith collection.

differing from that of the coastal belt on the west and from the foothills and sierra on the east. There was a tendency toward sedentary life, fostered, no doubt, by an unfailing food supply, which consisted of fish and waterfowl in great plenty, and many vegetable products, including acorns, seeds, roots, and various kinds of fruit. The occurrence of inundations in the lowlands must have interfered to some extent with full sedentation, the people being driven periodically into the higher plains and foothills.

It seems likely that the earthworks scattered along these valleys were built by one or more of the tribes found in possession—the Wintun, the Maidu, the Mutsun, the Yokuts, and the Shoshone (Powers)—since neither the works themselves, their contents, nor the miscellaneous artifacts of the valley present features discordant with the condition and achievements of these peoples. I believe that no important distinction has been drawn between the implements and utensils of the mounds and those of the surface of the country generally. The osseous remains exhibit no novel or distinctive features.

Implements and utensils have a wide range in form and in the classes represented, but withal are simple in character and indicate no unusual advance in culture. They include mortars, milling plates, pestles, and rubbing stones, of usual range of form, cylindrical steatite vases of local type (Plate 24 *a*), stone pipes, rings, discoidal stones, grooved pebbles, and flaked implements of many forms. Certain obsidian implements of the Stockton district present exceptional characters (Plate 25). There are also tools of bone and shell and ornaments in great variety. There are many objects of baked clay, globular, discoidal, dumb-bell shape, etc., some of which may have served for use in slings (Plates 26, 27 *a* and 28). This use of clay balls is noted as occurring among some of the modern tribes. The artistic sense was evidently not greatly developed among these people, as attested by the almost entire absence of the carving or engraving of life forms. In Plate 28 *b* a number of bone implements obtained from these mounds and tastefully decorated with incised workings are shown. They are, for the most part, whistles, or flutes, and correspond closely with similar objects found in mounds and middens along the California coast. Among the pendant ornaments of abalone shell are specimens representing, apparently, a double-headed bird, suggesting the double-headed eagle of European nations (Plate 24 *b*), but the conception is quite as likely to be of purely native origin. In general the contents of the mounds include few relics of recent origin.

Enterprising archæologists in Stockton have made valuable collections from the mounds of the neighboring lowlands. Mr. H. C. Meredith has published a number of articles describing and illustrating his explorations and finds, and Mr. J. A. Barr has made a most valuable collection, chiefly from local mounds. Prof. Edward Hughes,

of the city schools, has also taken a deep interest in local archæology and kindly drove out with our party to the neighboring flats, where a number of mounds were examined.

The objects shown in the accompanying plates belong to the Stockton collections or were presented to the U. S. National Museum by Stockton collectors. Brief descriptions are given in connection with the plates and more detailed information may be obtained from the writings of Mr. Meredith.[1]

## TULARE RESERVATION, TULARE COUNTY.

On our way south from San Francisco to Los Angeles we made it a point to stop at Porterville, in Tulare County, long enough to pay a visit to the Tulare Indians[2] located on South Fork of Tule River, 20 miles eastward from the village. Their reservation was originally situated on the fertile lowlands where the river valley opens out upon the plain, but this land was acquired by the whites and is now largely under cultivation. The Indians were removed to the upper valley, where they now dwell in comfortable, though simple, frame houses. Here the narrow, rocky banks of the river rise abruptly into massive and precipitous mountains. It is indeed a secluded and lonely spot, an ideal retreat for the humble remnant of a people once laying claim to the broad, rich lowlands now traversed by railways and dotted with incipient cities. The houses are scattered at short intervals for 2 or 3 miles along the valley. A little farming is done and some stock is kept, and there is a school near the agent's residence, attended at the present time by twenty or thirty children.

Near the upper end of the reservation a most interesting spot, known as Painted Rock, or The Painted Rocks, was visited. Here the little stream is confined to a narrow gorge bordered by enormous masses of granite, over which the torrents pour in the wet season. At the sides, however, there is enough comparatively level ground to accommodate dwellings and small fields. This site, it appears, was a favorite resort of the native peoples, the Tulares or their predecessors, for a long period of years. The protected surfaces of the great granite blocks are still covered with symbolic paintings in bright colors, and some of the flatter exposed surfaces are pitted with mortar basins wherein the women of many generations have come to grind acorns and seeds. In Plate 29 are shown two excellent illustrations of one of these milling places, there being between forty and fifty more or less deeply sunken conical mortars visible. Another large, rounded mass near by contains upward of seventy-five of these pits, varying from shallow basins or incipient mortars to conical depressions a foot in depth.

[1] H. C. Meredith in Moorehead's Prehistoric Implements, p. 258; Land of Sunshine, October, 1899; American Archæologist, II, p. 319.

[2] The Yokuts of Powers. Tribes of California, Contributions to North American Ethnology, III, p. 369.

MORTAR ROCK, TULARE RESERVATION.

Portions of this rock are now covered with soil, so that a number of the mortars are probably hidden. Possibly some of the depressions may originally have been pot holes, worn by the descending waters of the cascade, but all are now manifestly artificial in contour. The present inhabitants do not appear to use these particular mills, but employ mortars, both fixed and portable, in the immediate vicinity of their dwellings. This may be the group of mortars referred to by Powers, who says that "in remote times they were accustomed to rub their acorns to flour on a stone slightly hollowed, like the Mexican metate, which was a suggestion of the Mouse, but nowadays they pound them in holes on top of huge bowlders, which was a suggestion of the wiser Coyote. On a bowlder in Coarse Gold Gulch I counted 86 of these acorn holes, which shows that they must have been used many centuries."[1]

My own feeling about this matter is that the metate is a late rather than an early form of the millstone, since these great groups of mortar pits must be very old, and the mortars dug up at considerable depths in this valley as well as elsewhere are generally globular. I was especially interested in observing that the process of shaping stone by pecking with hammers is known to the Tulares. Some specimens show recent work, and inquiry of Mr. James Alto elicited the statement that the women shaped mortars and pestles in this way, employing "days pecking and pecking."

At one of the dwellings, which had the appearance of an ordinary, comfortable farmhouse, the entire family was engaged in thrashing and cleaning up the recently harvested crop of beans. Plate 30 shows the man threshing with a flail, while the women are seen separating the beans from the hulls by fanning in shallow basket trays. From the old woman of the household—the grandmother—who seemed to be owner of all domestic articles, we secured baskets, stone boiling sticks, mortars, and pestles. The large, roundish mortar shown in Plate 31 was in use by one of the women, but we were told that this piece had been found at a depth of several feet in digging an irrigating trench; that it was very old, and belonged, they believed, to peoples that had preceded the Tulares. However, such mortars, as well as others of varying form, were seen in use on the reservation.

The manner of using snares in capturing pigeons is shown in Plate 32. Roundish earthen platforms from 5 to 8 feet in diameter are constructed among the great bowlders in favorable locations, on which are set willow-twig loops for securing decoy birds. At one margin of the platform a brush or reed shelter is built, in which the man with the snares hides himself. The loops of the snares lie extended upon the platform, and when the birds, alighting to feed with the decoys,

[1] Tribes of California, Contributions to North American Ethnology, III, p. 376.

become entangled they are quietly withdrawn beneath the shelter and secured (Plate 32 *b*). The lower illustration, *a*, shows James Alto, the reservation policeman, emerging upon the platform from the shelter. Powers mentions the use of snares, probably of this class. He says that "for snaring quail, rabbits, and other small game they employed cords made of a kind of 'wild flax' found in the Sierras. I presume this 'wild flax' is milkweed (*Asclepias*)." In Plate 33 *a* we have a drawing of one of the snares and in *b* a game basket of peculiar form. In the same plate are included a pair of wooden fire sticks or tongs, *c*, and a looped stick for lifting stones from the boiling baskets, *d*. The native scrubbing brushes and the yucca bulbs from which they are made are illustrated in Plate 34.

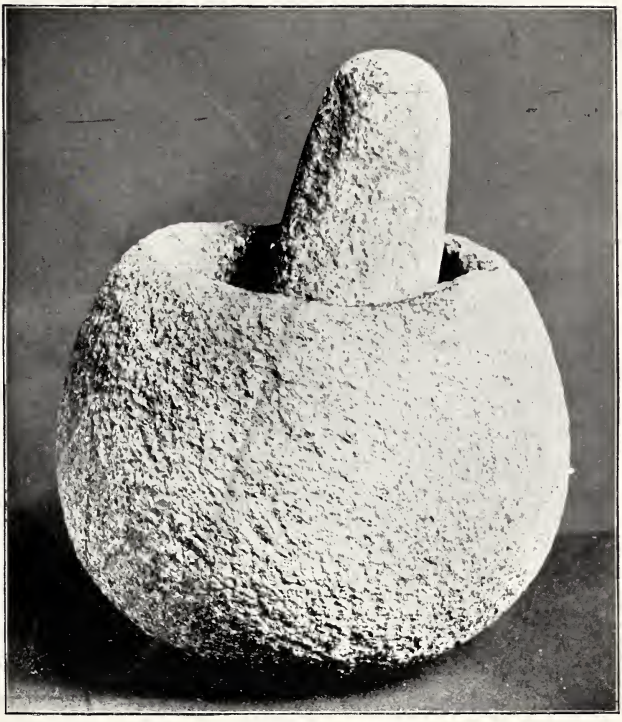
At one of the houses near the pictured rocks I was so fortunate as to obtain parts of a ceremonial costume, consisting of a feather headdress, ear ornaments, thorn needle with asphaltum head, etc., shown in Plate 35. The importance attached to these articles was made apparent by the care with which they were wrapped up in especially prepared coverings and hidden away. There was also a more complete costume in possession of one of the men of the family, but this could not be secured. It included the primitive skirt made of long strands, forming a fringe, upon which are strung pine nuts and beads. It was said that these were parts of old time ceremonial dance costumes, still used on great festal occasions.

The Tulares are among the most expert of basket makers. Plate 36 illustrates three winnowing baskets, and Plates 37 and 38 three bowl shaped pieces of excellent quality. The fine specimen shown in Plate 39 *a* and *b* and Plate 40 was obtained from the good woman, Mrs. Pedro Tennis, who had just completed it. The low, flat-topped bottle form is apparently peculiar to this tribe. Occasionally a piece is seen much flatter in the body than this specimen. The workmanship and æsthetic treatment are of a high order, and the deteriorating influence of modern conditions is seen only in the use of red worsted, which I suppose takes the place of red feathers of earlier times. The baskets in use to-day include also carrying baskets of usual California types.

The native names for the basket-making materials and for the various articles illustrated in the accompanying plates are not given for the reason that I had no time to verify the data secured from James Alto, although he seems a thoroughly honest and intelligent man.

I was particularly anxious to secure one of their gambling trays, which are large, flat basket plaques, but the last specimen in the valley, so it was said, had recently been carried away by a collector. We were so fortunate, however, as to secure an unusually old and fine example through the courtesy of Mr. and Mrs. C. F. Briggs, of San Francisco, who had obtained it from an old woman living on a ran-

THRASHING AND WINNOWING BEANS, TULARE INDIANS.

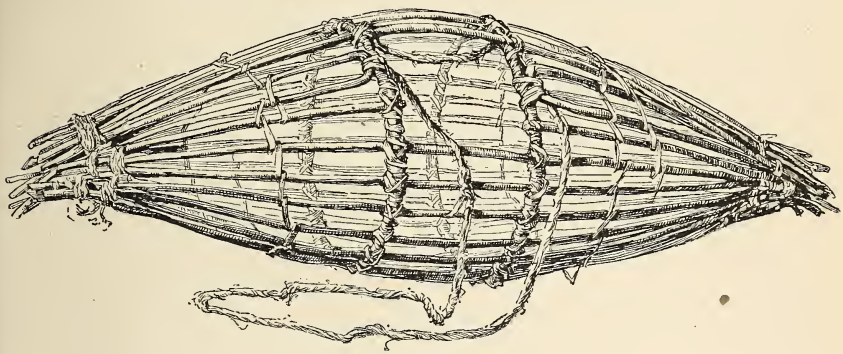


MORTAR AND PESTLE IN USE BY TULARE INDIANS.

Diameter of mortar 10 inches.

PIGEON SNARING, TULARE INDIANS.

*A*



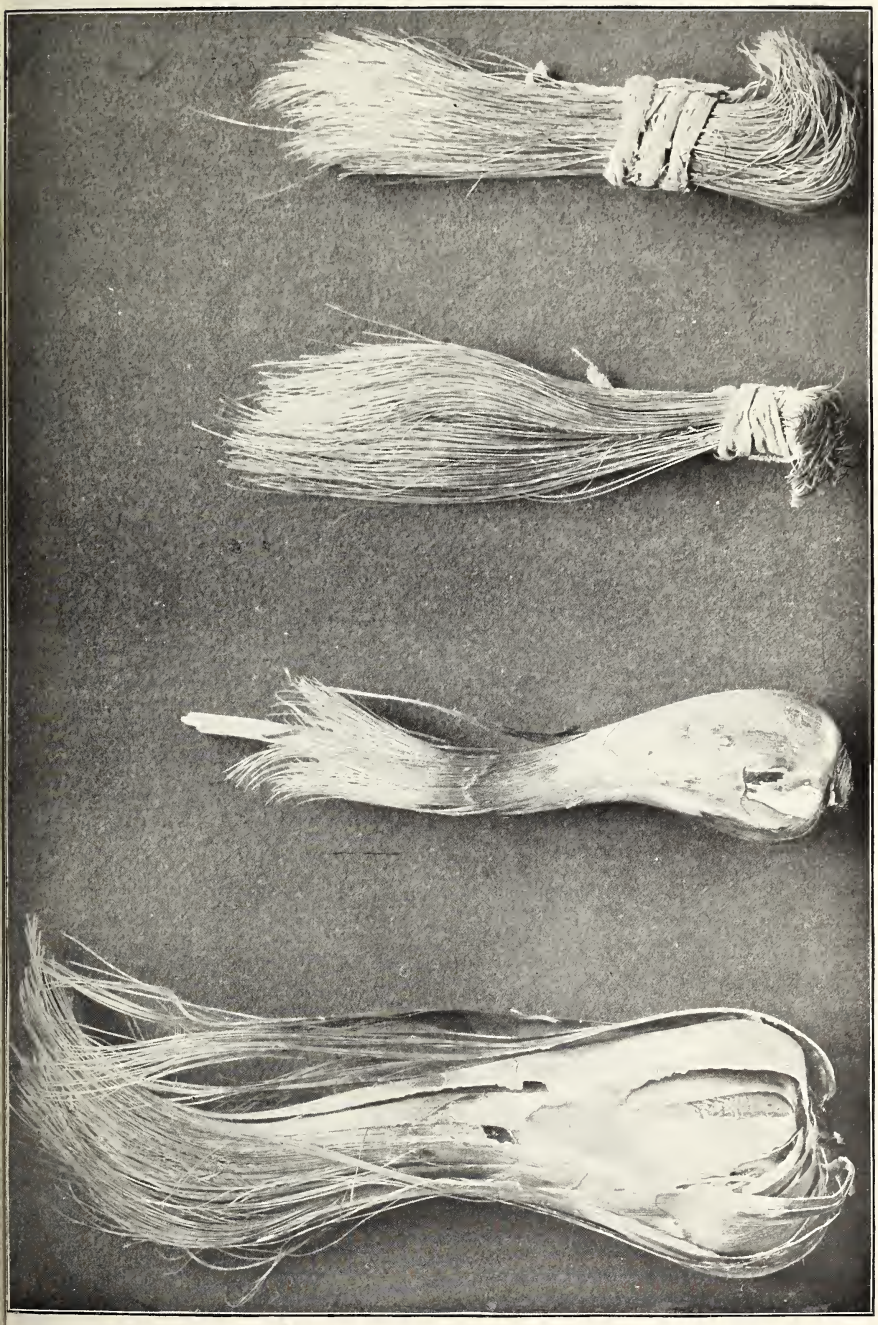
*B*

*C*

*D*

IMPLEMENTS, TULARE INDIANS.

*A*, Pigeon snare; *B*, game basket; *C*, wooden fire tongs; *D*, looped boiling sticks.



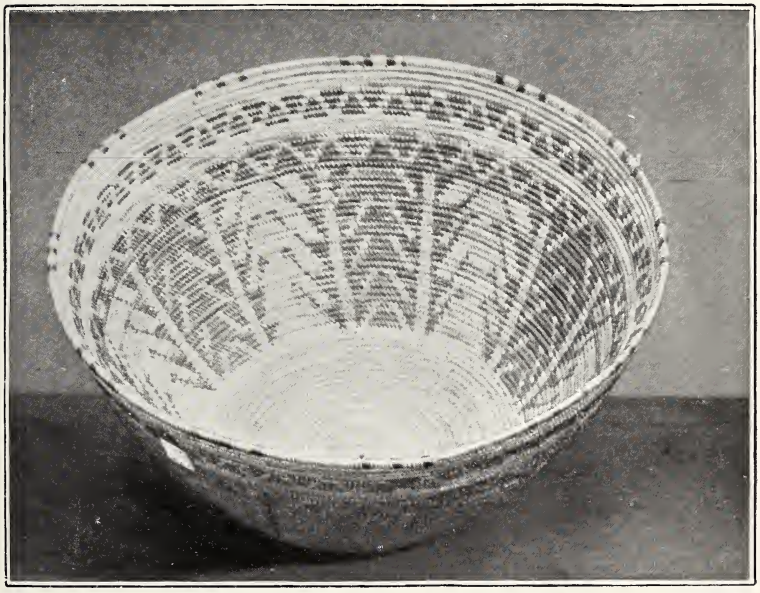
YUCCA BULBS AND BRUSHES, TULARE INDIANS.

CEREMONIAL HEADDRESS AND MATTING CASE FOR SAME, TULARE INDIANS.

About one-seventh actual size.

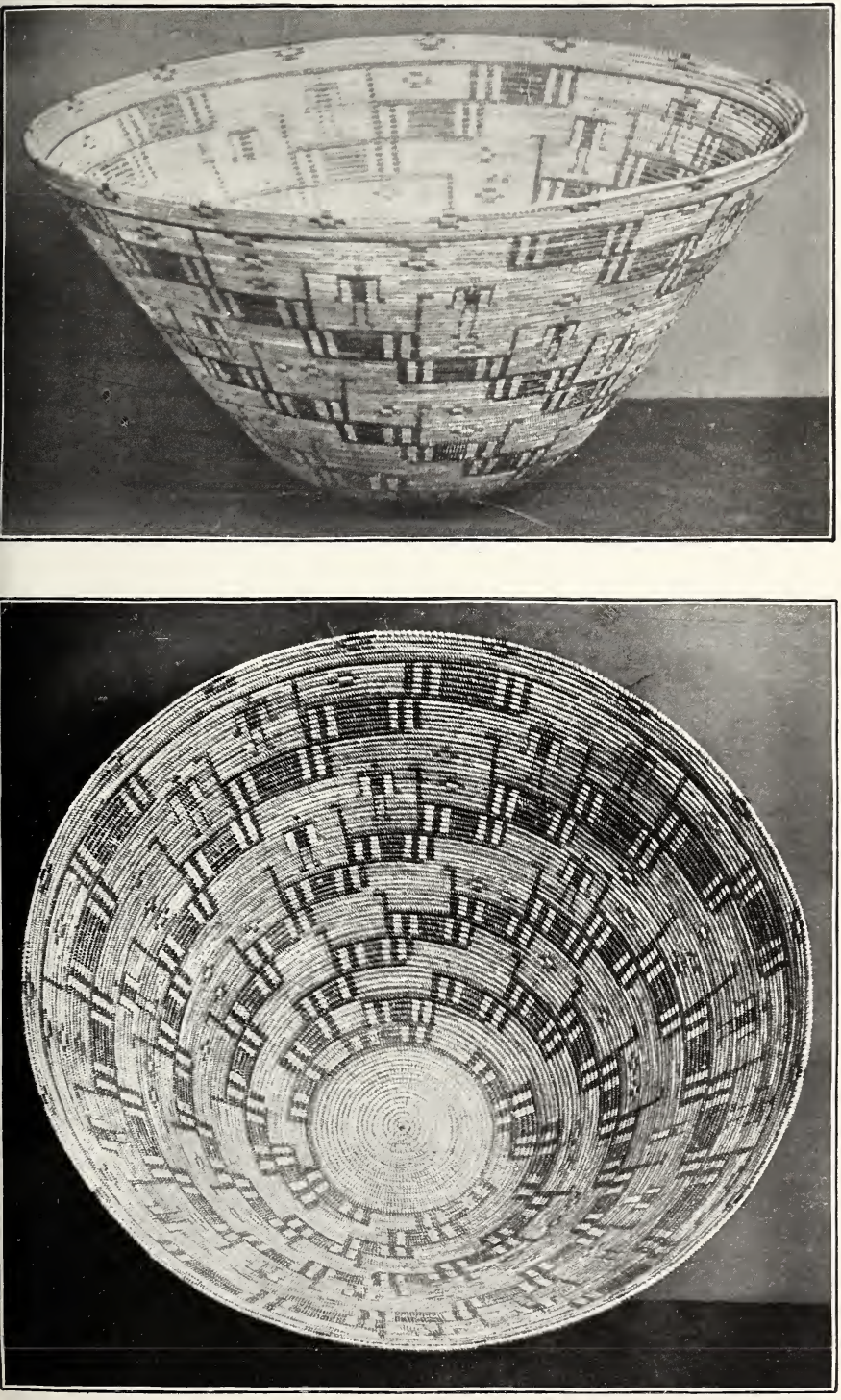
WINNOWING BASKETS, TULARE INDIANS.

Largest specimen 23 inches in length.



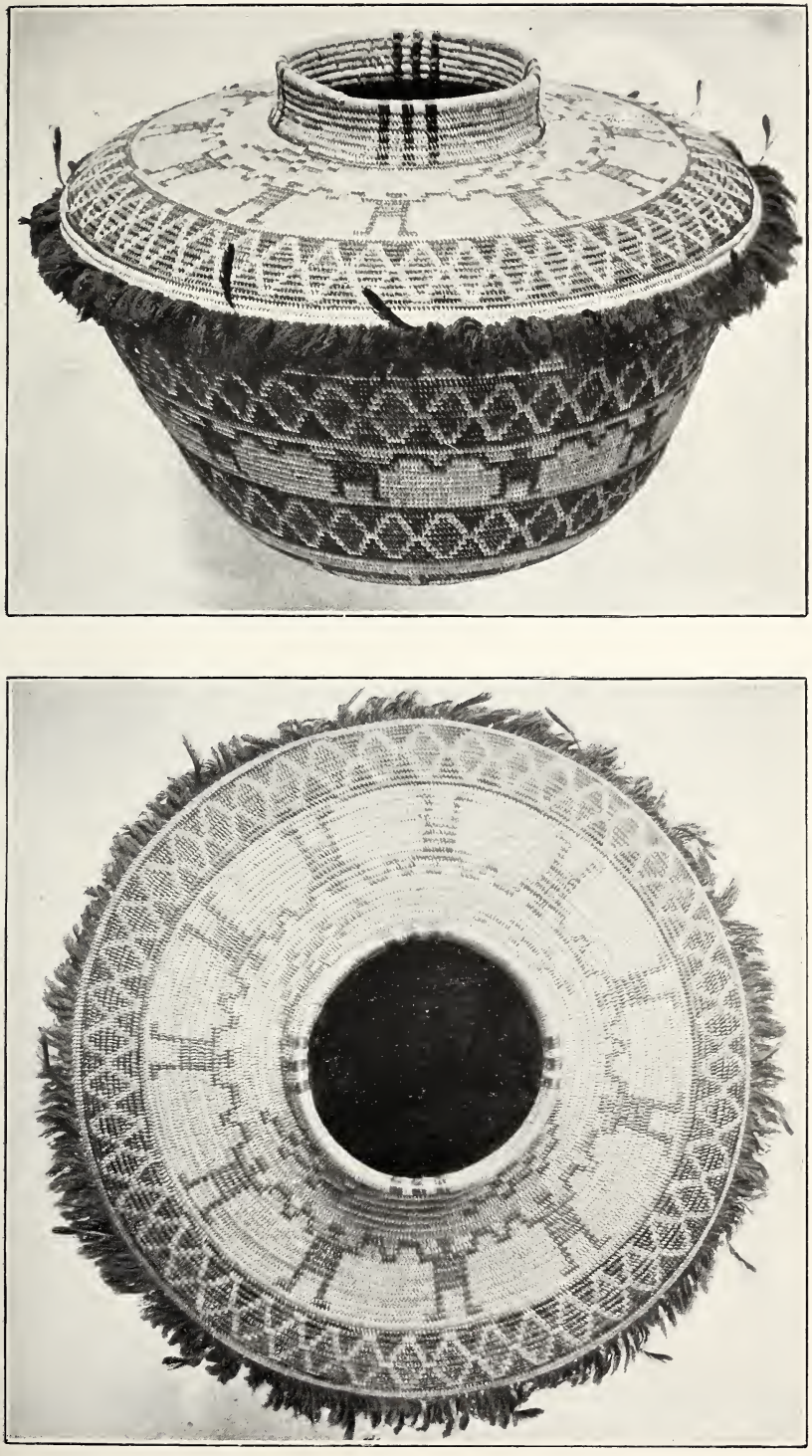
BOWL-SHAPED BASKETS, TULARE INDIANS.

Diameter 15 inches.



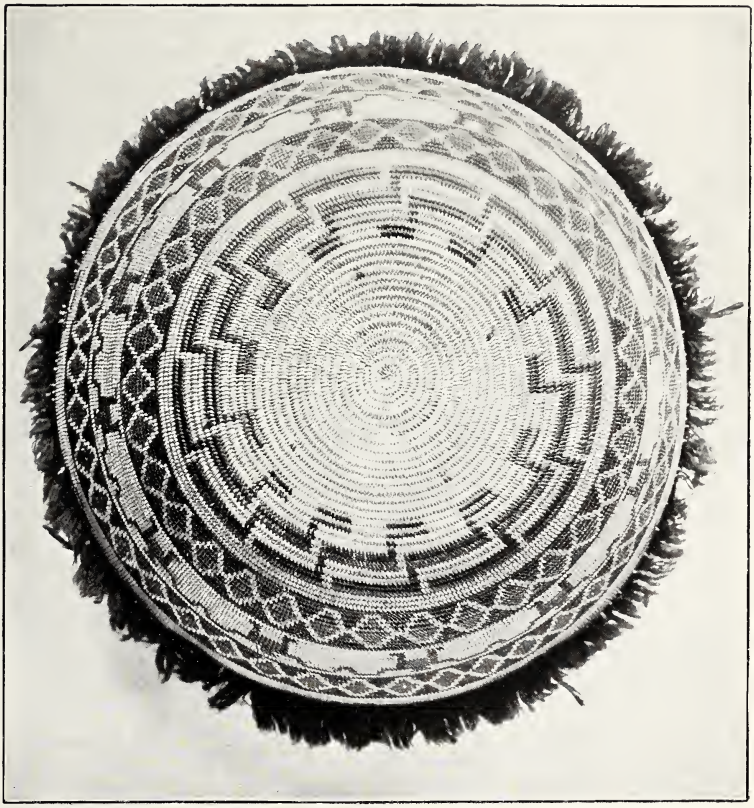
BOWL-SHAPED BASKET, TULARE INDIANS.

Diameter 17 inches.



BOTTLE-SHAPED BASKET, TULARE INDIANS.

Diameter 11 inches.



BOTTLE-SHAPED BASKET, TULARE INDIANS. (VIEW FROM BENEATH.)

Diameter 11 inches.

TULARE GAMBLING TRAY.

Diameter 28¾ inches.

TULARE SQUAWS USING GAMBLING TRAY. PRIMITIVE COSTUMES.

cheria near Lemoore, in Kings County, who parted with her treasure only after the strongest persuasion on the part of the visitors. It is shown in Plate 41.

The following account of the game as played by the Tulares is quoted from Mr. Stephen Powers:

> The Gualala style of gambling prevails all over the State, but the Yokuts have another sort which pertains exclusively to the women. It is a kind of dice throwing, and is called u-chu-us. For a dice they take half of a large acorn or walnut shell, fill it level with pitch and pounded charcoal, and inlay it with bits of bright-colored abalone shells. For a dice table they weave a very large, fine basket tray, almost flat, and ornamented with devices woven in black or brown, mostly rude imitations of trees and geometrical figures. Four squaws sit around it to play, and a fifth keeps tally with fifteen sticks. There are eight dice, and they scoop them up in their hands and dash them into the basket, counting one when two or five flat surfaces turn up.
>
> The rapidity with which the game goes forward is wonderful, and the players seem totally oblivious to all things in the world beside. After each throw that a player makes she exclaims *yet-ni* (equivalent to "one-y"), or *wi-a-tak*, or *ko-mai-eh*, which are simply a kind of sing-song or chanting. One old squaw, with scarcely a tooth in her head, one eye gone, her face all withered, but with a lower jaw of iron and features denoting extraordinary will—a reckless old gambler and evidently a teacher of the others—after each throw would grab into the basket and jerk her hand across it, as if by the motion of the air to turn the dice over before they settled, and ejaculate *wiatak!* It was amusing to see the savage energy with which this fierce old hag carried on the game. The others were modest and spoke in low tones, but she seemed to be unaware of the existence of anybody around her.[1]

The account given by Mrs. Briggs is to the same effect. In Plate 42 I venture to reproduce a drawing illustrating the use of the gaming tray as set forth so vividly in Mr. Powers's account.

## SOUTHERN CALIFORNIA.

Southern California has much to interest the student of archæology as well as the traveler seeking an ideal country. It is a region occupied formerly by numerous and probably greatly diversified peoples, presenting, however, no great dissimilarity in culture. Their contact on the east and south was with peoples lower in the scale of progress than themselves, and it appears that few elements of culture from the more distant regions ever crept in. A small number of widely scattered aboriginal communities still survive to the present day, but present no very considerable points of interest to the student, their original customs having been destroyed or greatly modified by mission rule.

The region including Santa Barbara County and the group of islands lying off the coast is probably the richest, archæologically, in California and furnishes vast numbers of artifacts of usual classes, among which the mortar and pestle predominate to a remarkable degree. A

[1] Tribes of California, Contributions to North American Ethnology, U. S. Geographical and Geological Survey of the Rocky Mountain Region, III, 1877, p. 377.

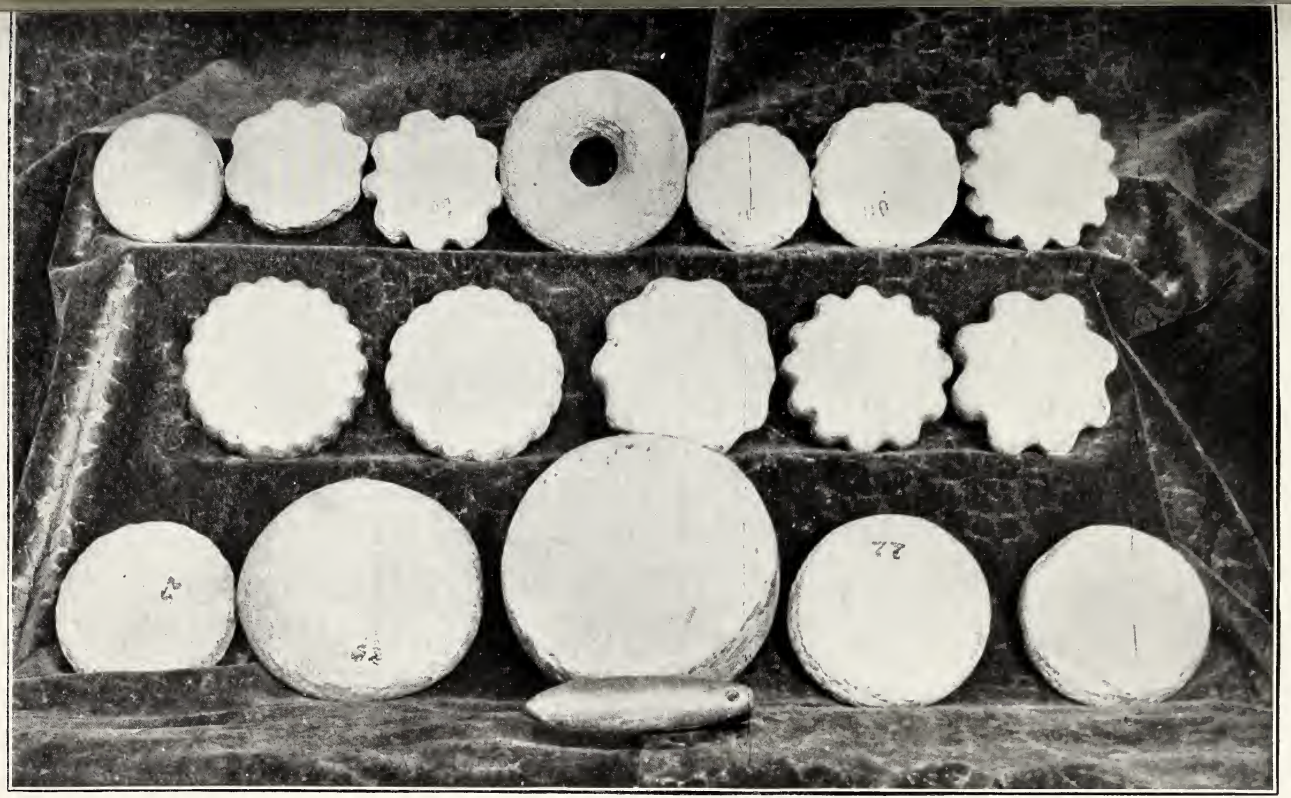
number of enterprising collectors have occupied this field, and in Los Angeles I had the pleasure of studying some fine collections made by Dr. F. M. Palmer, a type series, well arranged and labeled, being displayed in the museum of the Chamber of Commerce. Mr. W. S. Campbell, a local dealer in Indian relics, has many interesting things, prominent among which are a number of rare and beautiful baskets made by the Santa Ynez Indians, a tribe now approaching extinction. Other collections made by Rev. Stephen Bowers are partly in his own hands and partly in possession of Mr. H. N. Rust, of South Pasadena. In addition, a large and valuable collection, not, however, purely local, is owned by Mrs. A. C. Low, of Pasadena. Mr. Rust's collection also contains an interesting series of objects from an ancient village site in the suburbs of Pasadena, and he permits me to introduce here two plates, in which are seen a large number of the objects collected—Plates 43 and 44. In this collection there are no globular mortars or cylindrical pestles, but numerous mealing plates showing extensive use, and many oblong and discoid mullers. Several annular and stellar shaped stones are unique. The whole group seems to indicate a people related in many ways with the tribes of the Sierra. The village site from which the specimens illustrated were collected is situated on the bluff overlooking South Pasadena and on the line of Buena Vista street. When the grading of this street was under way Mr. Rust watched the work daily, saving more than a hundred implements and utensils. He was able even to locate some of the lodge sites by the larger number and greater variety of specimens found within limited areas. Besides the stone implements shown in the plates, one bone awl and a fire stick were recovered. Few flaked implements are found in the Pasadena region, and there is no pottery, and burial places and human remains have been sought for in vain.

At Santa Barbara I was permitted to examine a valuable collection made by Mr. L. G. Dreyfus, and the museum of the local historical society has many specimens of interest. The region has been explored by a number of scientific students, including Schumacher, Henshaw, Yarrow, and Yates. The principal village site at Santa Barbara is on the extreme end of a picturesque promontory at the lower end of the city, and the sea is slowly cutting it away. The location of the burial ground is indicated in the view presented in Plate 45 by a group of apple trees seen distinctly in the lower picture. Near by, on the low ground, is a large oblong mound, now occupied by a residence and believed by Mr. Dreyfus and others to be of artificial origin.

From Los Angeles it is a short railway journey to San Pedro, on the coast, and a steamer voyage of 25 miles out into the Pacific carries one to Avalon, a village occupying an exquisitely picturesque little harbor near the east end of Santa Catalina Island. While at this place I had the opportunity of examining two of the noted archæological

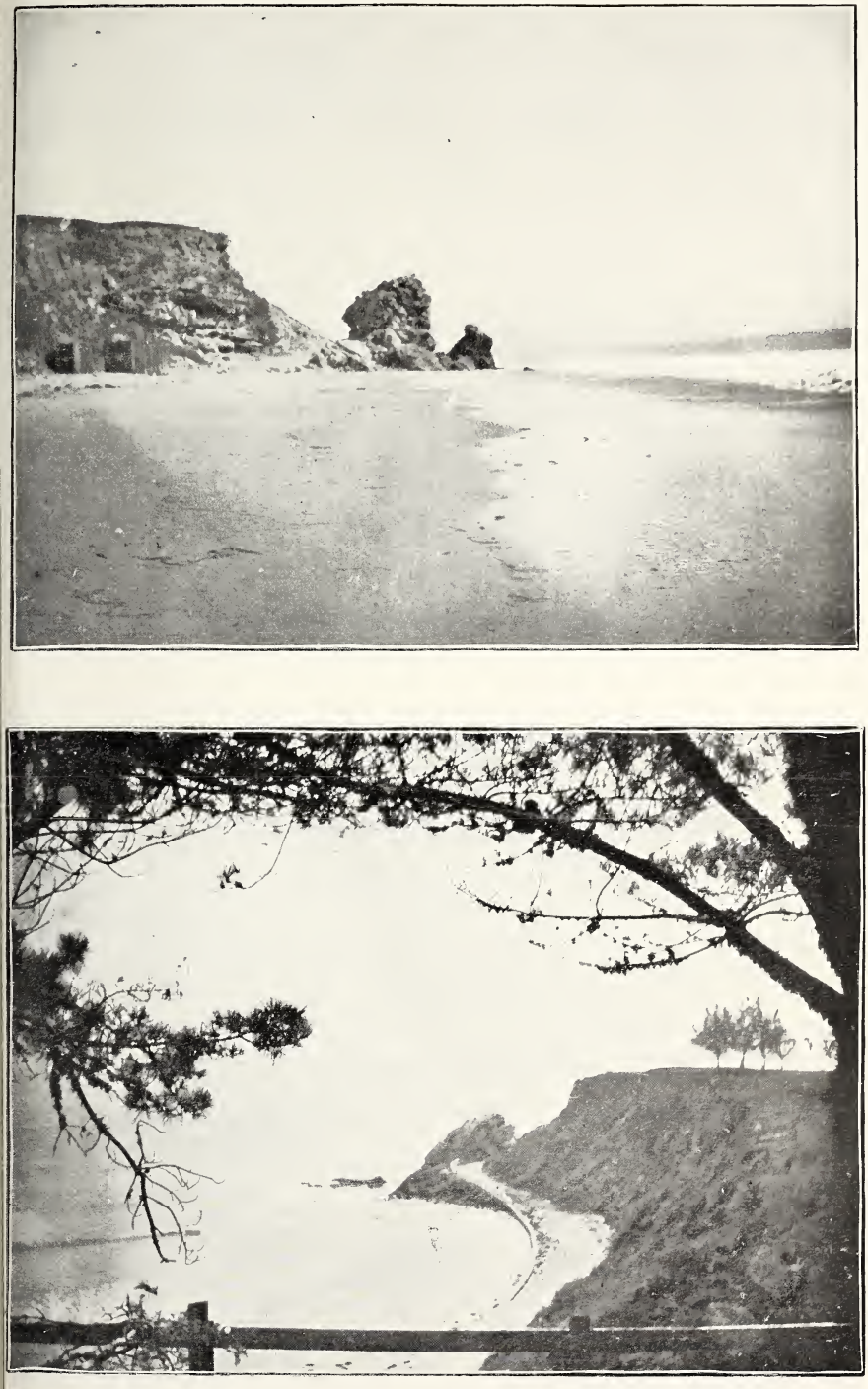
PASADENA VILLAGE-SITE ARTIFACTS.

Rust collection.



PASADENA VILLAGE-SITE ARTIFACTS.

Rust collection.



VIEWS OF SANTA BARBARA POINT, THE SITE OF A PREHISTORIC CEMETERY.

sites of this island—the soapstone quarries of Potts Valley and the shell deposits of the isthmus. These sites were explored by Schumacher many years ago, and the rich collections obtained by him are now preserved in the museums at Washington and Cambridge. I need not do more in this place than briefly record my observations and impressions regarding these sites.

Early in the morning of November 2, 1898, I set out on horseback with Mexican Joe as guide, to find the soapstone quarries some 10 miles to the northwest. We climbed the steep slopes from Avalon, meandered the lofty sinuous crests of the island, passing across the shoulder of Black Jack—a mountain rising nearly 1,800 feet above the sea—and descended into Potts Valley, which, if my identification be correct, opens down to the sea on the north of the ridge. At many points we encountered outcrops of steatite, and evidences of ancient mining were apparent on all hands. There were shallow excavations and heaps of débris surrounded by fragments of partially shaped vessels and the rude stone picks, hammers, and chisels with which the quarrying and shaping work was done. Near the site of the principal quarry reported upon by Schumacher there has been some recent quarrying by white settlers, but fortunately the outcrop from which the aborigines cut so many pots remains undisturbed. At the head of the shallow amphitheater of Potts Valley, which descends to the shore half a mile or more below, some great masses of rugged rock rise from the otherwise smooth slopes. Portions of these masses are composed of soapstone, and the surfaces from which lumps of soft rock were cut are in plain view. A vigorous growth of cactus plants covers the lower part of the exposure, but enough remains in sight to tell the story of former enterprise. The scars left by the workmen extend over 400 or 500 square feet of the steep surfaces of the rocky mass, and the views shown in Plate 46 disclose the scars and chisel marks to excellent advantage. The work of removing the rounded masses of stone from which the vessels were to be shaped was identical in character with that observed in the many soapstone quarries of the Eastern States, but so far as the markings now remaining show, the cutting has been more skillful, and it seems not improbable that the work in the examples illustrated has been done with metallic tools. It is reasonable to suppose that the trade in soapstone pots, carried on extensively between the islanders and the tribes of the mainland, continued to flourish for a considerable period after the coming of the white man, and in the latest work iron picks and shovels must have been used. Scattered about this rock and on the slopes above and below were fragments of partially shaped and broken vessels, besides numerous rude cutting tools and picks of hard stone. The latter implements had been shaped by flaking with hammer stones, some of which are distributed with the débris.

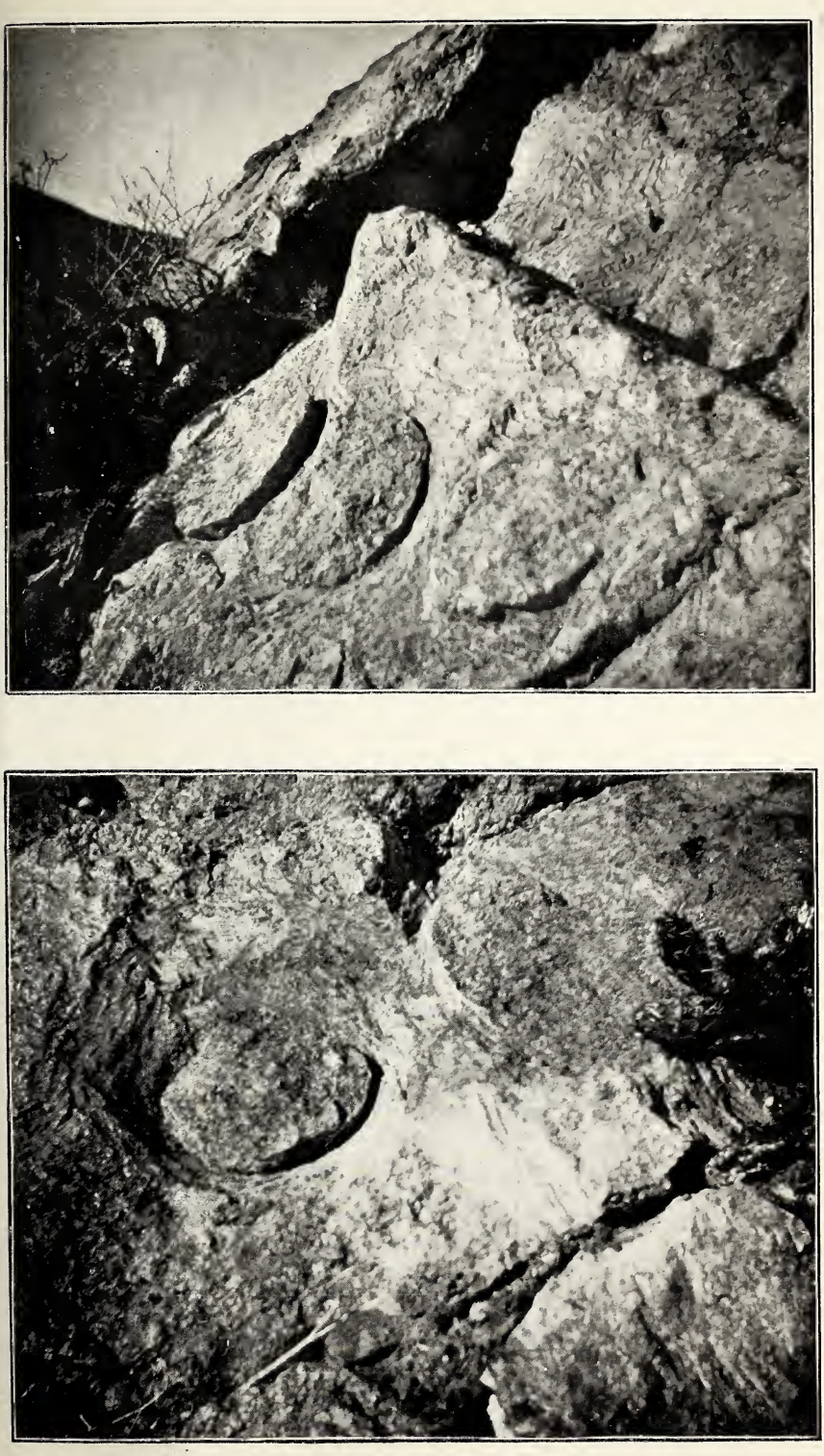
My own contribution to the study of this interesting spot was the discovery of an ancient grave on the nearly level top of a rounded knoll some 40 or 50 feet above the upper quarry face. I happened to observe the broken edge of a soapstone platter projecting above the hard soil. In removing this specimen other objects were brought to light. Remnants of a skull and jawbone and numerous bones of the trunk were found, but all were so near the surface that they had been more or less dissociated and broken up. There were also parts of three or four steatite vessels, one small pot, a round shallow dish, two oblong dishes, and a flattish oblong plate with squared end, probably a baking plate. Other articles were evidently mere burial offerings made for the purpose and doubtless symbolic. They include a steatite hook of a form common in the region, a miniature pestle of steatite, a peculiar object, apparently a much conventionalized fish or finback whale, three handles of steatite utensils, apparently dipper handles, an obsidian arrow point, and some much decayed shell ornaments. A number of these objects are shown in Plate 47.

The relation of the grave to the quarry face is shown in Plate 48. The figure in the foreground represents my companion engaged in exploring the grave, and the worked soapstone surface is behind him at the right. Beyond are the rugged cliffs, with a bit of the sea visible at the left.

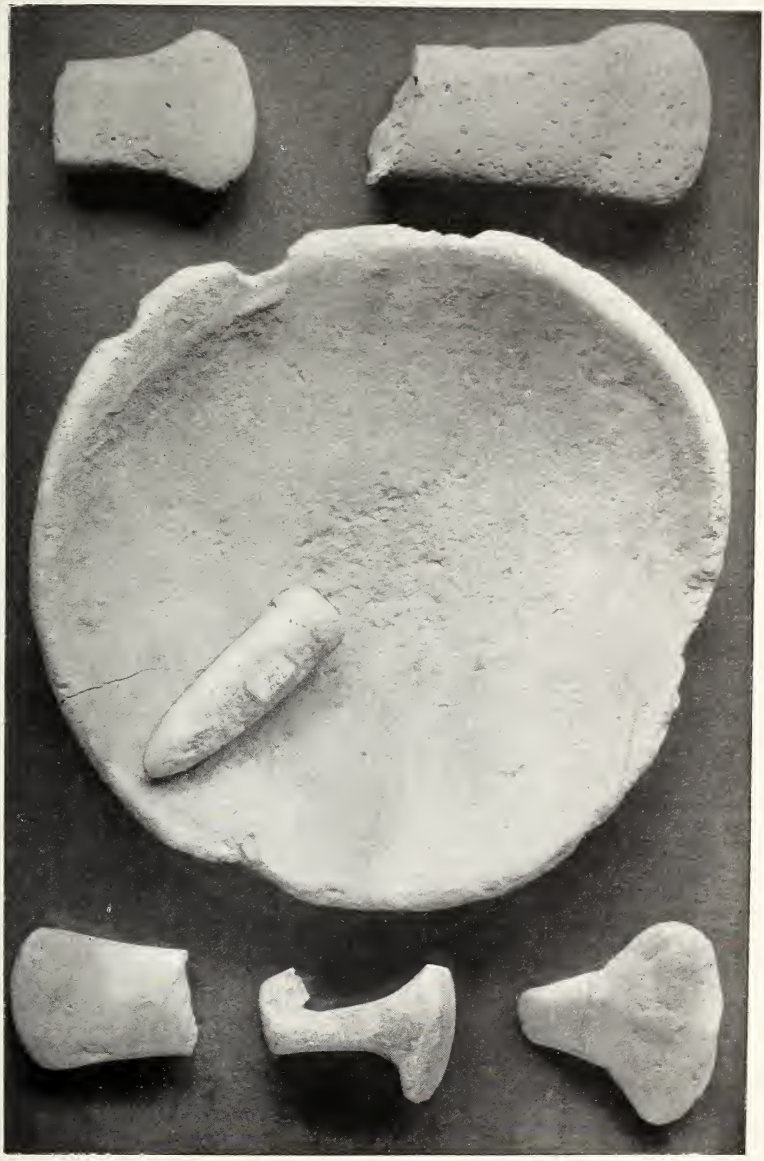
My study of this site was far from exhaustive, but I gained the impression that the ancient occupation had extended over a very long period. This must be the case if the vast number of utensils found in the region have had their origin in these quarries. I observed that the phenomena are practically identical with those of soapstone quarries of the east.

In a rock shelter some 200 yards southeast of the quarry examined I found evidence of ancient occupation. Deposits of kitchen-midden refuse cover the slope below, and in these were many abalone shells and some rude stone utensils, the latter including a flattish spatulate stone, one end of which was covered with asphaltum, as if used for a trowel in applying the liquid material.

Santa Catalina Island is extremely rugged and picturesque, and the coast is in large part inaccessible, but there are a number of small bays and inlets about the inner margins of which there is land enough to accommodate small settlements. One of the most favorable localities for a native village was at the point called the Isthmus, about 14 miles north of Avalon, where the opposite shores approach within a few hundred yards, and there is a low pass, not 20 feet in elevation, between the opposing beaches. The upper view in Plate 49 looks from this pass outward toward the Pacific, and the lower picture shows the opposite side turning toward the north. The houses in the latter view were occupied at the time of my visit, but I have learned from



TRACES OF ABORIGINAL WORK IN SOAPSTONE QUARRY, SANTA CATALINA ISLAND.



OBJECTS OF SOAPSTONE FROM A GRAVE, SANTA CATALINA ISLAND.

Dish 10½ inches in diameter.

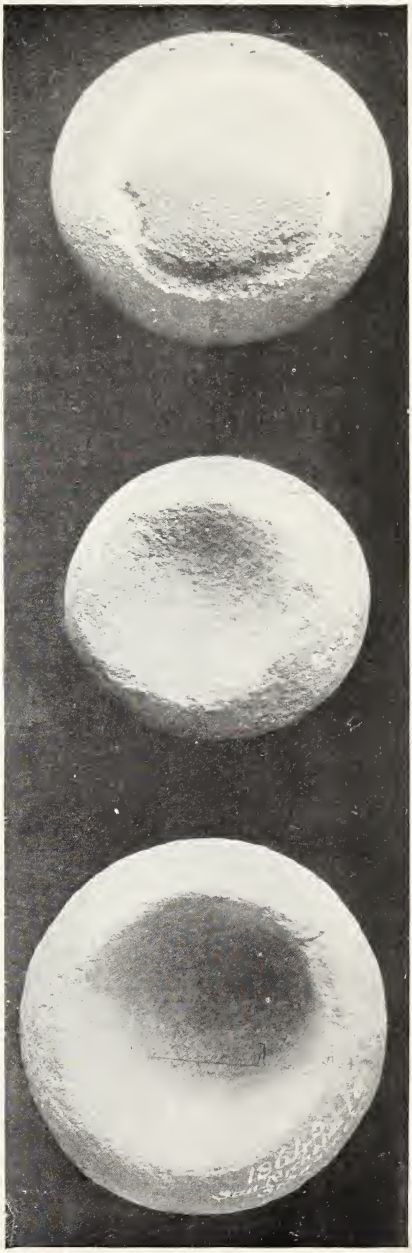
EXAMINING A GRAVE AT A SOAPSTONE QUARRY, SANTA CATALINA ISLAND.

*A*

*B*

VIEWS AT THE ISTHMUS, SANTA CATALINA ISLAND. ANCIENT CEMETERY OCCUPIED BY GROUP OF BUILDINGS.

*A*, Looking south; *B*, looking north.



SMALL MORTARS, UNFINISHED AND FINISHED, AND UNFINISHED PESTLE.

Finished mortar $5\frac{1}{4}$ inches in diameter; pestle $16\frac{1}{2}$ inches in length.

Mr. E. L. Doran, of Avalon, who kindly carried me in his gasoline launch to this spot, that Banning Brothers, who own most of the island, have begun extensive improvements, changing the appearance of the place and obliterating the ancient cemetery. The houses in the view are situated on the village site examined so carefully by Dr. Paul Schumacher and reported upon by him in a number of publications. The site was covered by several feet of midden refuse composed of black earth and shells, and in which were many burials. It is clear that this site was extensively utilized by the natives, and that an important village stood here for a long period. It appears also that it was occupied at the time of the arrival of the whites and for a considerable period subsequently, as the graves contained many articles of iron and glass.

Numerous interesting details regarding the ancient remains of the island are given in a charming little book published by Mr. Charles F. Holder,[1] who has adopted the island as a home, and a map is presented in his work locating many village sites, cemeteries, and shell heaps. The evidences of occupation are so numerous and extensive that, as with the other islands of the group, there must have been formerly a large population, not differing essentially, however, in blood or culture from the people of the mainland.

Although soapstone was used so extensively on the islands and carried in great quantities to the mainland, other stones were not neglected, and sandstone especially was employed. In some cases, no doubt, it was cut from the living rock, but more commonly waterworn masses, already approximately shaped, were used. In some sections also concretionary forms were utilized, many of which were already rounded and hollowed out on one side, making the work of shaping easy. The manipulation of sandstone in the making of mortars and pestles is illustrated in Plate 50.

Mr. Horatio N. Rust, of South Pasadena, whose collections have already received attention, has had more or less intimate contact with a number of Mission tribes, and I prevailed upon him to visit the Coahuilas and other convenient communities for the purpose of making collections for the Museum. At Coahuila Mr. Rust called upon José Costa, prominent among the Indians of southern California. The family was found in a new wooden house, the old adobe residence having recently been destroyed by an earthquake. He found the old mother sitting under the brush shelter where she lives, making a basket. This, when finished, was purchased, and along with an unfinished specimen was forwarded to the Museum. In the collection also are specimens of the materials used. In making the better baskets she used a strong grass, which is scarce and much prized. It grows only high up

[1] Charles Frederick Holder, Santa Catalina, an Isle of Summer, San Francisco, 1895.

in the mountains. Mr. Rust found it on the banks of a small stream at Bergman post-office at an altitude of about 5,000 feet, growing in bunches like pampas grass and resembling that variety very closely. These people also make baskets of bulrushes which are dyed black. The rich brown mottling seen in many of the baskets is due to the natural color of the base of the bulrush, the upper stem being lighter in hue. Splints of a hard wood are also employed in basket making. A woman was seen reducing these to a uniform size by drawing them through a hole in a tin can cover, and often biting them into shape with her teeth. Children were learning to make baskets, and it appears that many more are manufactured than formerly, since ready sale is found for them. Southern California baskets are much coarser than those farther north in the State. They make rude baskets, from 3 to 5 feet in diameter and 3 feet high, of willow splints, in which they store grain, acorns, and other food products. These are placed upon scaffolds about 6 feet high, constructed by setting strong forked posts in the ground and laying poles across.

At Agua Caliente women were seen making pottery, and specimens were secured at Coahuila, Santa Rosa, and San Felipe. After grinding the clay in a mortar and kneading it they form the base of the vessel by placing a small portion upon a flat stone and bringing it into the desired shape with the fingers. When the base has assumed the form of a saucer they hold a smooth waterworn stone on the inside to support it, while with a smaller stone kept wet they rub the outside, curving the walls gradually upward; then drawing in the edge they form the neck by skillfully manipulating the clay with the fingers. To harden and even up the walls of the vessel they hold a smooth stone inside and beat the outside with a rude paddle. Specimens of the modeling tools were secured for the Museum. At Agua Caliente pottery is baked in an oven, to form which they dig into the side of a bank and line the walls with cow dung. The vessel is then introduced and covered with the fuel. When the fire is well under way they close up the opening and permit the vessel to remain until properly baked.

These people spin strong hempen and mescal cords by twisting the thread in the fingers. Next they hold the newly formed cord against the thigh and twist it under the palm of the hand. At Agua Caliente they make valuable saddle blankets of mescal fiber. These are woven on four stakes driven in the ground, the weavers sitting on opposite sides on the ground.

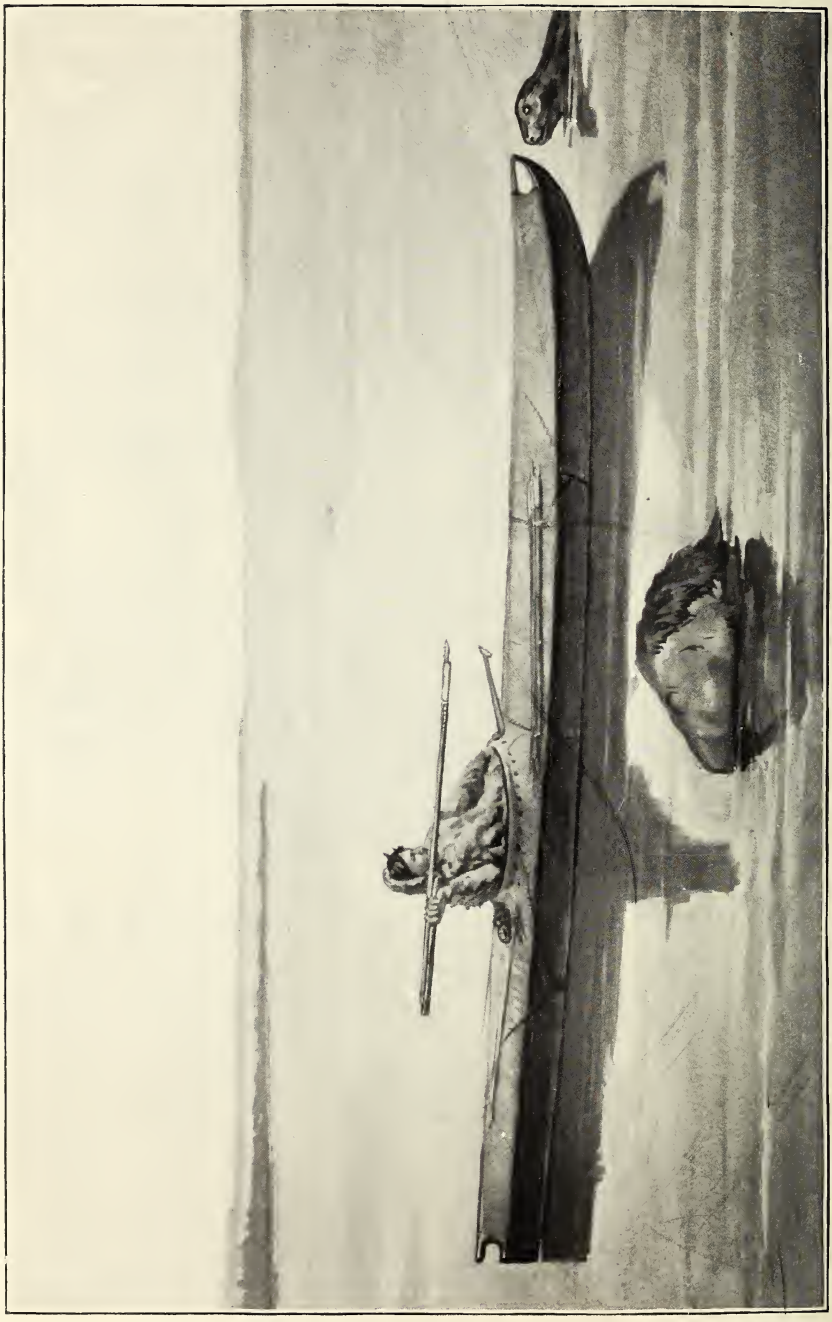
At Mallayhon Mr. Rust witnessed the spinning of hemp and the making of nets. The hemp is prepared by beating the ripened stems until the wood is thoroughly broken, when the bark fiber is separated and ready for spinning. The meshes of the net are tied about a stick held between the knees.

The dressing of deer skins required very simple devices. A smoothly shaved, flattish stick about 6 feet long was placed in a slanting position against a convenient tree. The skin was hung over the stick and held at the top by a peg, and the hair and flesh were removed by pressing the skin against the flat stick and scraping with an old iron drawing knife. The skin was first soaked in water until the hair and flesh were easily scraped off. In earlier times stone implements were used, the skin being spread on the ground or over a smooth rock. In finishing the Indians apply grease or brains and scrape and rub until soft.

The maguey or American aloe or mescal grows wild among th mountains of the California desert. To prepare it for food the Indians dig or cut out the bases of the stalks which bear the leaf stems. These vary from 6 to 20 inches in diameter. To cook them they dig a saucer-shaped pit from 10 to 20 feet in diameter, then set a large stone up in the center and pave the entire surface with smaller stones. Upon this they build a fire, mixing the mescal stumps and wood together and thus burn the woody fiber from the mescal. The smaller stumps are kept near the outside, and as they become sufficiently burned are thrown out, then the larger ones in turn. When they are done the mescal is piled about the central stone and covered with hot stones. Next they cover all with earth, allowing it to remain forty-eight hours. When the pile cools down the mescal is ready for use. Cooked specimens often measure 6 inches in diameter. The taste resembles that of sirup baked out of sweet apples. It is very agreeable food and will keep perfectly good for months.

Sometimes it is necessary to go a long way for wood to burn, and several families make their pits near together for the sake of company. When they have no metal they burn an ironwood of the desert and sharpen the end for a digging tool. The mescal is ready for cutting when it begins to send up its flower stalk. If the Indian can not cut and bake all he wants at the proper time he cuts out the growing flower stem, which checks the growth, and the plant keeps in this condition for months.

Acorns form an important article of food. The Indians crack them with the teeth or a stone, partly dry, then shell and dry again. When dry they are ground in stone mortars, then the fine flour is soaked in ollas to remove the tannin, and the mixture is poured into basins formed in the sand. For some days they pour water into the basins until the tannin is all filtered out; the flour settles in the sand basin as a thick paste. This is scooped up by hand and placed in an olla. Having thus secured the most of it without sand, they gather up the balance regardless of sand, put it in another olla, add water, stir it well, and pour off the paste, leaving the sand. In this way the "Byota" or acorn meal is prepared, sweet and wholesome, and much preferred by the Indian to our wheat flour.



THE MASTER OF THE HARPOON.

After E. W. Nelson.

# ABORIGINAL AMERICAN HARPOONS:

# A STUDY IN ETHNIC DISTRIBUTION AND INVENTION.

BY

**OTIS TUFTON MASON,**

*Curator, Division of Ethnology.*

NAT MUS 1900——13

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# ABORIGINAL AMERICAN HARPOONS:
# A STUDY ON ETHNIC DISTRIBUTION AND INVENTION.

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## INTRODUCTION.

The aborigines of the Western Hemisphere were intimately associated with the animal world. Their methods of taking animals for their activities were as follows:

1. Gathering without devices.
2. Gathering with devices.
3. Striking, stunning, bruising.
4. Slashing with edged weapons.
5. Piercing, by stabbing, by thrusting, by hurling, or by shooting.
6. Taking in traps or blinds.
7. Hunting by means of other animals.
8. Capturing with light, fire, and smoke.
9. Overcoming by asphyxiation, poisons, and drugs.

In piercing devices the ends proposed are two, namely, to reach some vital part, and hence to kill instantly, or to insert a barb or toggle under the skin and thereby retrieve the animal. These piercing devices may be divided into three subclasses, namely: Those with a smooth blade, called lances, for stabbing; those whose blades or working part have barbs on the sides for retrieving as well as piercing, and the harpoon subclass with movable head. A harpoon is a piercing and retrieving device with a movable head. Few other inventions of savagery show better the progress of thought in devising means for overcoming difficulties than the harpoon. In order to differentiate this implement from others of the piercing type, let it be understood that the head is always set loosely on the end of a shaft, to which it is attached by means of a line. Even when shot from a bow, missiles having this structure are called harpoon arrows. Every part of the harpoon, by its dimensions and form, by its presence or absence, or by its material and attachment, lends itself to classification in the studies of progress concerning the apparatus itself and its geographic distribution.

Between the sharpened stick or bone, which wounds by piercing and which is the fundamental device of all lanceolate weapons, and the harpoon, there are one or two intermediate forms among the Eskimo usually associated with the harpoon. They may be called the hinged lance head and the detachable lance head. In the first named the ivory or bone piece, into the front of which the leaf-shaped blade is set, is at its other extremity hinged to the foreshaft, like the loose shaft of a whale harpoon. The detachable lance head has a handle or tang of wood about a foot in length and less than an inch in diameter. On the front is set a leaf-shaped or a triangular blade, and the conical base of the tang fits into a socket in the end of the heavy shaft. In some examples there is an ivory barb projecting from the handle near the blade, which is a spear characteristic, but in this instance it was designed to retrieve the lance head and not the animal. E. W. Nelson figures and describes a great variety of these.[1] He says in relation to them that they are used when the seal or walrus has been disabled so that it can not keep out of reach of its pursuers, and the hunter paddles up close alongside and strikes the animal, driving the detachable head in its entire length. The head remains in the animal, and the hunter immediately fits another point into the shaft and repeats the blow, thus inserting as many of the barbed heads as possible, until the animal is killed or the supply of points exhausted. Every hunter has his private mark cut on these points, so that, when the animal is secured, each is enabled to reclaim his own. These lances are companions of harpoons, and examples will be shown in their proper connection.

The manner of functioning with the harpoon will be considered only incidentally here, inasmuch as there is abundant literature on the subject prepared by those who have been eyewitnesses of its action (see frontispiece). For the Eskimo the student may consult Dall (1877), Holm (1887), Boas (1888), Turner (1894), Murdoch (1892), and Nelson (1899). The older writings are abundantly quoted in these, and the titles of authorities for the western Eskimo will be found in H. H. Bancroft (1874–1876). It is with pleasure here acknowledged that the careful observations of these explorers on the spot have made possible this comparative study.

### PARTS OF THE HARPOON.

The fundamental or ideal parts of the harpoon are head, loose shaft, foreshaft, shaft, ice pick, line, and float. These parts rarely all coexist in a single specimen, but the Eskimo have them all on their various harpoons, while each part also takes on a multitude of forms and itself is often quite complex. Besides these fundamental parts, there are also a number of accessories, which will be considered in their places.

[1] The Eskimo about Bering Strait, 1899, pp. 145–148, pl. LVII.

There are two varieties of harpoons, based on the shape of the head—the barbed and the toggle; but the former or simpler passes insensibly into the latter. Barbed harpoon heads are attached to the shaft by means of a connecting line tied to the butt or tang of the head, and may be used on animals with tough hides (see fig. 12). The toggle harpoon head is attached to its line or sling by its middle, the head is driven entirely into the animal, and toggling under the skin gives the firmest possible hold (see fig. 1). It will give the best idea of the apparatus to take up the parts of the harpoon in order, and after that to study the question of distribution.

### PARTS OF THE BARBED HARPOON.

The parts of a complete barbed harpoon are barbed head, foreshaft, shaft, line, feather, and bladder (Plates 8, 9, 11, 16, 17, 18, and 19).

*Barbed head.*—The head of a barbed harpoon is a piece of wood, bone, antler, ivory, shell, or metal, with tooth-like projections from its margins pointing backward, so that it may pierce the hides of animals but can not be withdrawn. Its action is to ratchet and retrieve the game. The parts of a barbed head may be referred to as point, body, margins or edges, sides or faces, barbs, line hole or groove, and tang (see figs. 13, 18 and 81). As to position the barbs are unilateral or bilateral. The unilateral may be from one to many. Bilateral barbs are sagittate, alternate, or opposite. The tang is wedge-shaped, conical, or spindle-shaped, and in relation to the connecting line is roughened, notched, bulbous, or pierced.

*Foreshaft.*—The foreshaft of a barbed harpoon is a more or less cylindrical or pear-shaped piece of heavy material, bone or ivory, fitted on to the end of the shaft, and having a socket in front to receive the tang of the barbed head. In the rudest harpoons, such as the Fuegian, nothing of the kind exists. In some examples the foreshaft is elaborately carved in imitation of the heads of aquatic animals. The attachment of the foreshaft to the shaft is by means of a splice, a wedge-shaped tang and kerf, a socket in the shaft fitting a projection on the foreshaft, or a socket in the loose shaft fitting a projection on the shaft.[1] There is no other part of the mechanism which taxed aboriginal skill more than the joint between shaft and foreshaft. The socket in the front of the foreshaft for the tang of the barbed head has inserted in it a plug of wood having a small cavity into which the tang of the head fits loosely. The loose shaft and the shaft are bound fast together with sinew twine or fine rawhide line, the many ingenious knots appearing in the drawings (see fig. 83).

*Shaft.*—The shaft of a barbed harpoon is of wood, generally rigid, but of light weight. In length it varies from a few inches to many

[1] E. W. Nelson, The Eskimo about Bering Strait, 1899, pl. LVII *b*, figs. 33, 34.

feet; in thickness, from one-fourth of an inch to more than one inch. Its front end may be fitted to a foreshaft, but in the most primitive examples there is a rude split or a mere cavity dug for the tang of the barb. The manual or inner end of the shaft varies in form, being either tapering and without function, or fitted to receive the hook of a throwing stick, or notched for a bowstring, or having an ice pick of hard material securely fastened to it.[1] When not projected from a throwing stick or shot from a bow the barbed harpoon is held in or hurled from the hand. In that event hand rests or offsets are lashed to the shaft near the center of gravity.[2]

*Connecting line.*—The connecting line of a barbed harpoon at first was only a bit of string or thong uniting the head to the shaft. If there be no connecting line between head and shaft, the weapon is called a rankling arrow, because the head stays in the animal and causes death. However, the rude Fuegian inventors have gotten beyond that, for the thong is carried halfway down the shaft and made fast here and there with knots. The same happy thought is called by Murdoch an "assembling line," since it serves in case of a break in the shaft to save the pieces. In the larger harpoons and the more delicate ones the assembling line is a separate affair. The line of the more complicated barbed harpoons is fastened at one end through the line hole of the head. The other end is bifurcated, like the martingale of a bridle, or a kite string. One end of this martingale is tied to the shaft near the foreshaft, the other near the butt end of the shaft. When the harpoon is ready to be hurled the line is neatly rolled on the shaft, the head is placed in its socket, and a slipknot around the shaft takes the slack in the line. When the game is struck the head is pulled from its socket, the slipknot is released, and the line unrolls. The foreshaft being of bone, drops lowest in the water, so that the shaft acts as a drag. It serves also as a buoy, since the upper end, especially when feathered, bobs about over the water and shows the position of the game.

The feathering of the barbed harpoon is that of the arrow. Looking at this characteristic from the southward, the occurrence of feathers on the shafts of harpoons in lower Bering Sea is not abnormal. The float of the barbed harpoon is a small inflated bladder, stomach, or intestine attached to the side of the shaft, helping to keep the latter erect in the water. These structural elements are much more highly developed in the toggle series now to be studied. The barbed harpoon is of especial interest to the archæologist, who finds heads of bone or antler with holes and knobs or grooves for attaching the connecting line and every variety of barb, in both shell heaps and cemeteries throughout Canada and the United States.

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[1] The Eskimo about Bering Strait, 1899, pl. LIV and LV.

[2] Idem., pl. XLVII *b*, figs. 31–32.

PARTS OF THE TOGGLE HARPOON.

*Toggle head.*—In describing a toggle harpoon head it is necessary to orient it, not that the Eskimo is known to have held any portion of the apparatus uppermost habitually, but for the sake of convenience in comparing different types and styles. However, Captain Herendeen informs the author that so far as his personal observation goes the barb of a toggle harpoon head, like the cock feather in an arrow, is held uppermost. (See fig. 1.)

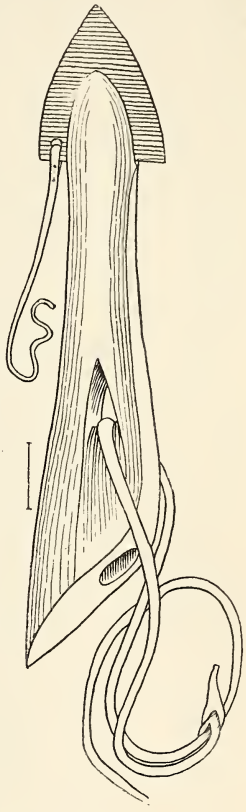


Fig. 1.
TYPE FORM OF TOGGLE HEAD.
Hudson Bay.
Collected by Ludwig Kumlien.
Cat. No. 25654, U.S.N.M.

To orient a toggle it must be placed with the barb or spur at the rear end uppermost, the point away from the observer. It will then be possible to speak of the top, back, or upper side; of the bottom, belly, or under side; of the right margin and the left margin; of the front or point; and of the butt end or rear. In those large examples, wherein there are right and left barbs in the rear, with the blade in the plane of the widest diameter of the body (Cat. Nos. 45947, 63948, 53950, figs. 34–50), the top may be distinguished from the bottom by means of the line hole, which runs in a bent course through the body.

The parts of a toggle head have been discussed by Mr. John Murdoch.[1]

When the toggle head is oriented it will be seen that it is possible to speak of the following parts: Body, blade, blade slit or kerf, line hole, line grooves, barbs (side and rear), socket for loose shaft, butt or rear end of the body, loose shaft, blade line, loose-shaft loop or running loop, head line or leader, ornamentations, and owner marks. Each one of these parts should be described and even its absence noted. The characteristics of these parts are as follows:

*Body.*—Its material, shape in outline and section, and dimensions.

*Blade.*—Its material, shape, relation to the body, whether a part of it or not; orientation, whether vertical or horizontal in the plane parallel with the line hole or across it.

*Blade slit or kerf.*—Whether saw cut or coarse; its orientation. The blade cover is frequently a case or cover for the entire toggle head.

[1] Ninth Annual Report of the Bureau of Ethnology.

*Line hole.*—The opening through the body of the toggle head for the rawhide sling or leader on which the toggle head hinges. In very modern examples and in the heads of small seal harpoons the hole is bored straight through, but in old specimens two much coarser holes are bored, one from each side of the belly inward and upward, meeting midway. All sharp edges within and without are carefully smoothed and rounded to protect the line and to facilitate the toggling. The points to be considered concerning the line hole are the shape, size, and method of boring, and its position with reference to the other parts of the toggle head. Line holes run directly through the narrow body type, but in a curved path through the belly of other types. In a few abnormal specimens it stands vertical, but in the great majority of examples it goes horizontally across the body. Holm figures toggle heads from east Greenland, in which the head is hinged to the foreshaft by means of a rivet.

*Line grooves.*—Gutters or channels extending backward from the line hole in which the rawhide line lies out of the way. In fact the line grooves are backward extensions of the line hole. Their width and depth have relation to the width and thickness of the rawhide line used. In old specimens they are wider and clumsier.

*Barb or spur.*—The projection backward in a toggle head at its butt end has for its function to catch into the flesh of the animal beneath the skin, so as to revolve the head ninety degrees, and thus to effect the toggling of the head in the wound, as in the fastening of a trace chain. In its way it is as important as the blade, and it will be seen that quite as much ingenuity has been spent on this part as on any other. If, for example, when the animal is struck, the spurs of the rear barb were covered by the rawhide line the head might not toggle; hence, in a toggle head of the old-fashioned type the line hole lies below the center of the mass. The entire projection of the toggle head back of the line hole may be called the spur to distinguish it from marginal barbs also sometimes present.

*Shaft socket.*—The socket is a conoidal excavation in the butt end of a toggle head, into which the forward end of the shaft or loose shaft fits loosely. It will be readily understood that the socket is centered as exactly as possible. There is little or no variation in this part except of size and neatness. When the toggle head has been thrust into a beast the foreshaft or the loose shaft must be withdrawn in order to allow the weapon to do its work.

*Butt.*—The butt or rear end of a toggle head is shaped in relation to the barb especially and also to the socket. In fact, the upper portion of the butt end is a part of the barb or spur. The exact method of shaping and treating this part seems to depend largely on the material, whether ivory, antler, or bone. The first named is solid, and the butt is acute angled above and sawed off square below. The other

materials have more or less of spongy core or are hollow. In such examples the butt is mitered off with the acute angle at the barbs, and then scooped out and dished about the socket.

*Blade line.*—This is wanting in a great many examples. It is a little twine of sinew extending from the inner left-hand corner of the blade, where it is looped into a small perforation, backward to the first wrapping of the leather sling or leader.

*Leader or sling.*—The toggle sling is a loop of rawhide thong or sinew twine, a foot, more or less, in length, passing through the line hole of the toggle head at one end and at the other end attached to the main line by means of a splice, toggle, or clasp, to be described later. The two ends of this sling are spliced or joined after the neatest and most elaborate Eskimo styles. At one or more points the two sides of the loop are carefully united by wrapping (fig. 83). In the collections of the U. S. National Museum the smaller harpoon heads with leaders are accompanied with sticks of pine wood on which the apparatus is kept stretched when not in action (fig. 84). In the great harpoons, as will be learned in the description of the line, there is no leader or sling to the toggle head, which is hinged at once onto a bend in the end of the main line. Without the hinging line the movable head is only a rankling device. For instance, the loose head of many South American arrows, formed of a socketed bone of a monkey, remains in the wound, but not being attached to a line for retrieving it is not a harpoon head. The step between the two, however, is but a short one.

*Loose shaft.*—The part of a toggle harpoon which, at its forward end, fits into the socket of the head and in some way is hinged or joined to the foreshaft at its hinder end, as seen in figs. 2, 48, is called the loose shaft. The two varieties are the spindle-shaped and the conoidal. The former is joined on to the leader or sling of the toggle head by a running loop or grommet (fig. 83); the latter is strapped to the end of the shaft by a rawhide thong, and makes a ball-and-socket joint (fig. 49). In either case the body of the loose shaft is perforated with one or more holes. When the toggle head is in place on the loose shaft the line is drawn taut, so that the loop or bone eyelet on the line may be buttoned over its peg on the shaft (fig. 79).

Writers on the Eskimo harpoon say that the kneejoint between the loose shaft and the foreshaft is to prevent the accidental breaking of the shaft. Captain Spicer gives additional functions to this structure of the implement. He says that it aids in the shipping and unshipping of the toggle head with reference to the loose shaft after the eyelet on the line is over its peg on the shaft. When an Eskimo hunter would prepare his harpoon for striking, he puts the eyelet which is attached to the line over the peg on the shaft, sets the loose shaft at an angle in the socket of the shaft, puts the toggle head in position, and

straightens up the loose shaft. This brings all taut for the stroke. As soon as the game is struck the shaft is pulled to one side by the movements of the animal, the loose shaft comes out of its socket and detaches itself from the toggle head. This enables the hunter to pull away his shaft easily and instantly.

*Foreshaft.*—The foreshaft of a harpoon is the working end of the shaft, and is usually a block of bone or ivory neatly fitted on. Foreshafts vary in material, being of antler, bone, ivory, or metal; in size and shape, from the delicate front of the sea-otter harpoon to the clumsy variety on the Greenland whaling harpoon; in the mode of attachment to the shaft, in the socket, and lashing for the loose shaft (see Plates 6, 8, 9, 10, 12, 15, and 18).

Fig. 2.

LOOSE SHAFTS OF TOGGLE HARPOONS.
Cumberland Sound.
Collected by Ludwig Kumlien and Lucien Turner.
Cat. Nos. 90165, 2991, 34098, 34063.
After Franz Boas.

*Shaft.*—The shaft of the harpoon is of wood; in treeless areas, of driftwood, but in the north Pacific it is a long, slender pole of cedar. For the purpose of study, shafts have to be considered in relation to materials, shapes, and sizes; to hand stops or rests for thrusting; to line pegs, throwing stick pegs, assembling line, etc. For catching sea-otter the dart shaft is half an inch in diameter and 4 feet long, while some of the clumsy Greenland examples are 2 or 3 inches in diameter, and the east Greenland deep-water variety and sled variety for killing on the ice at a distance have shafts many feet in length, requiring two men to work them.

The shaft has the double functior of stabbing and retrieving. For the former (1) it may be thrust at the victim, in which case, in order to give a firmer grasp, a projecting piece of wood or bone or ivory is fastened near the center of gravity to stop the hand. Near this is frequently found a peg, over which is hooked the line to hold the head firmly on to the loose shaft. (2) It may be thrown as a javelin from the hands. (3) It may be hurled from a throwing stick. This method will be more fully described in a

special paper. The series begins with the plain shaft, and includes the hand-rest type, the throwing stick type, the Giliak long pole and floating-head type, the east Greenland sled-point type, the east Greenland deep-sea shaft type, and the Amazon type, in which the throwing stick is cast overboard.

By the function of retrieving is meant recovering the game after it has been struck. For this purpose the shaft is in many cases thrown overboard, and, being attached by one end of the line, while the other is tied to the harpoon head in the animal, acts as a drag and a buoy to impede the progress of the animal and to show its position.

*Ice pick.*—On the butt end of the harpoon shaft may be found, in arctic examples, a long ivory pick for enlarging a hole in the ice in order to remove the game. This is replaced with a boat-hook arrangement in others. Types of the butt end of the shaft exist in the forms following:

1. The plain butt, without function.
2. The feathered end, akin to the arrow.
3. The socketed end, for throwing stick.
4. The Greenland type, with ivory feathering.
5. The pick.
6. The carved pick, Nunivak type, on lances with loose heads.

Nansen[1] traces the elaborate Greenland harpoon shaft, with its many accessories, thus:

1. The Indian arrow, with its variety of feathering.
2. The feathered harpoon darts in southeastern Alaska.
3. Farther north the disappearance of the feather and the occurrence of the small bladder on the shaft.
4. The harpoon, with line and skin float, the last named being detached from the shaft and attached to the head.

*Line.*—The line of the harpoon also has had its peculiar elaboration, answering to external exigencies and opportunities on the one hand, and to the ingenuity of the savage on the other. The Fuegian sinew thread, a few inches long, is far away from the Greenland whale line, and a series would take some such order as the following:

1. The Fuegian type, short sinew cord tied around both the head and the shaft.
2. The western Eskimo type, line tied to head and middle of shaft.
3. Martingale type, attached to shaft in two places.
4. With skin float, head fastened to line.
5. Entirely separate, with ivory or bone toggles for fastening to the leader strap of the head and to the float.

The harpoon line developed a deal of ingenuity in the textile art. Shredded sinew, thread, twine, and braid or sennit are in demand constantly. Rawhide line in great variety is also a necessity.

[1] Across Greenland, London, 1890, II, p. 260.

Here also originated the whole scheme of knots and splices, as will be abundantly shown in the illustrations that follow. The Eskimo made a button or frog on the end of a rawhide line by cutting a slit near the end and doubling the end back through the slit. They were extremely neat and skillful in fastening off lashings. Boas and Murdoch have given special attention to the Eskimo knots.

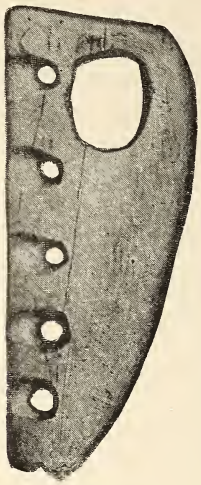


Fig. 3.
EYELET ON HARPOON LINE.
Cumberland Sound.
Collected by Ludwig Kumlien.
Cat. No. 34123, U.S.N.M.
After Franz Boas.

With the line, in its highest estate, go certain accessories, such as the eyelet, for making fast to a peg on the shaft (fig. 3), the line rack on the kaiak, and a multitude of ingenious inventions which Nelson calls "detachers," since they make it possible in the frozen Arctic for the hunter to take his apparatus apart under the most trying circumstances.

In order to prevent the line from getting out of order, a swivel is sometimes used. One brought from Cumberland Sound by Kumlien and described by him is represented in fig. 4. There was a ball in the hollow body of this instrument, which could not be pulled through any of the openings. One line was fastened to this ball, passing through the central hole, and another one to the top of the swivel. A simpler pattern is represented by Boas,[1] in which the ball in the socket would be a spherical knot on the end of the line.

*Floats.*—The sealskin bag used as a float on the end of the line of the harpoon for killing whale and beluga is in Unaleet ăgaŭ ŭk, bag; in Malemut Ăÿgt nŭk; the float, in both dialects, is Ōă tuk. Nelson describes two sizes. The smaller one is fastened to the line after the beluga has become unable to struggle much. The large float which has tired the beluga is at the end of the line. This small one is gradually slipped nearer by the man in the kaiak until it is distant 4 or 5 feet, when the *coup* is made and the prey secured. Boas describes and figures examples from Cumberland Sound (figs. 5, 6).

Fig. 4.
LINE SWIVEL.
Cumberland Sound.
Collected by Ludwig Kumlien.
Cat. No. 34121, U.S.N.M.
After Franz Boas.

By far the largest floats in the U. S. National Museum collection are those of the Aht or Nutka whalers off Vancouver Island. The skin of a seal is taken off whole, making a float 3 feet long and 2 feet wide.

*Line rack.*—Of the rack on the kaiak in front of the hunter (Unaleet, Achal ook; Malemut, A shal odk) for holding the rawhide line, Nelson

[1] Sixth Annual Report of the Bureau of Ethnology, p. 481.

says that the line is coiled on it with harpoon attached to one end and the large float to the other end, and lightly fastened back of the hunter. When the line has nearly run out the float is thrown overboard. The rack is fastened to the kaiak with grass strings, so that, should the line

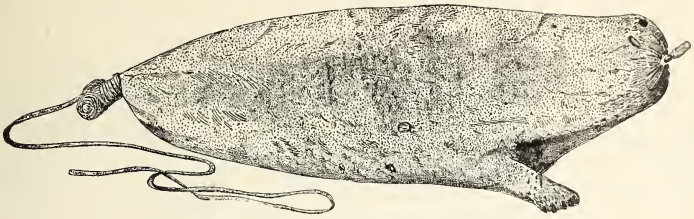


Fig. 5.
SEALSKIN FLOAT.
Cumberland Sound.
Collected by W. A. Mintzer. Cat. No. 30009, U.S.N.M.
After Franz Boas.

become entangled, the rack would be easily torn away without upsetting the craft. (Plate 14.) It would then act as an impediment to the progress of the animal.

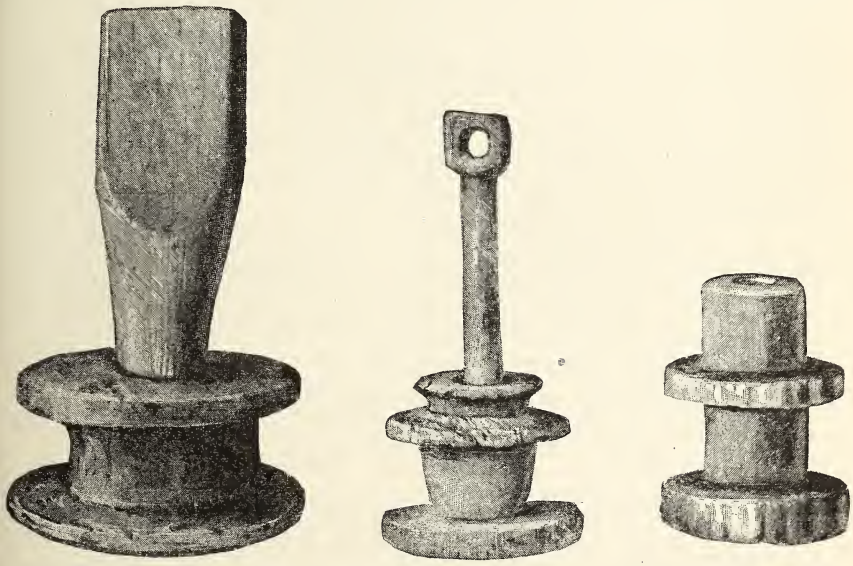


Fig. 6.
MOUTHPIECES TO FLOATS.
Cumberland Sound.
Collected by W. A. Mintzer and Ludwig Kumlien. Cat. Nos. 29986, 34118, 34119, 34120, U.S.N.M.
After Franz Boas.

In the accompanying plate (after Nelson) will be seen a great number of harpoon parts just mentioned. (Plate 1.)

16125. Small toggle harpoon head with stone blade and leader of rawhide done up on a short piece of wood. The cap belonging to this head is shown above. Nunivak Island. William H. Dall.

33465. Finger rest for harpoon, triangular in form and ornamented with a carving of a seal in low relief. Fastened on to a shaft by means of a lashing through three perforations. St. Michael. E. W. Nelson.

33632. Toggle head of a walrus harpoon of late pattern, since the carving is mechanical in outline. Norton Sound. E. W. Nelson.

33641. Finger rest for harpoon shaft in form of a bird's beak, fastened on to the shaft by a lashing through three perforations. Norton Sound. E. W. Nelson.

36097. Foreshaft of seal harpoon, cylindrical in form, showing wedge-shaped notch and the method of attachment to the end of the wooden shaft. Big Lake. E. W. Nelson.

37377. Toggle head of a walrus harpoon with stone blade, showing the method in which the leader of rawhide is attached to the loose shaft by means of sinew thread. Chalitmut. E. W. Nelson.

37417. Foreshaft of bone carved in shape of an animal's head and showing the method of attaching the foreshaft to the wooden shaft. Anagogmut. E. W. Nelson.

37671. Finger rest of bone, with triangular perforations for lashing to the wooden shaft. Kongigumogumut. E. W. Nelson.

38529. Slate blade of harpoon head. Lower Yukon. E. W. Nelson.

43461. Bone head of barbed harpoon for seals. Tang, wedge shaped; line hole, oblong; four barbs, all on one side. St. Michael. E. W. Nelson.

43865. Finger rest for large seal spears. In form of a seal's head; hole for lashing, triangular. Unalakleet. E. W. Nelson.

44077. Barbed head of large seal harpoon. Tang, wedge shaped; hole, circular; barbs, three on one side and two on the other. Mouth of Koyuk River. E. W. Nelson.

44405. Ice pick of ivory for end of large harpoon. Fastened by lashings through four perforations. Cape Nome. E. W. Nelson.

44421. Barbed head for seal harpoon. Line hole, oblong; barbs, two on one side and one on the other. Cape Nome. E. W. Nelson.

44699. Toggle head of seal or walrus harpoon, complete, with slate blade. Sledge Island. E. W. Nelson.

44703. Loose shaft of seal and walrus harpoon. Butt squared off and having a small spindle-shaped projection fitting in a socket on the top of the foreshaft. Sledge Island. E. W. Nelson.

44746. Iron head of seal and walrus harpoon. Sledge Island. E. W. Nelson.

44812. Finger rest for large harpoon. Sledge Island. E. W. Nelson.

45170. Finger rest for large harpoon. Sledge Island. E. W. Nelson.

45171. Finger rest for large harpoon. Sledge Island. E. W. Nelson.

45173. Cord fastener for large harpoon. Sledge Island. E. W. Nelson.

48276. Barbed head for harpoon. Nunivak Island. E. W. Nelson.

48293. Finger rest for large spear. In shape of a boat's rudder, set on by lashings around the shaft through three perforations in the rest. Nunivak Island. E. W. Nelson.

48471. Toggle head for harpoon (toy). Kegiktowik. E. W. Nelson.

48820. Slate blade of toggle harpoon head. Rasbonisky. E. W. Nelson.

63334. Old barbed and toggle head, for seal, combined, showing the method of providing shaft socket by lashing. St. Lawrence. E. W. Nelson.

63497. Foreshaft of barbed harpoon for seals. It fits into a wedge-shaped notch in the end of the shaft. St. Lawrence. E. W. Nelson.

63842. Finger rest. Head and neck of seal carved out from the material, probably antler. Attached by lashing to the thin, graft-like portion to the shaft. Point Hope. E. W. Nelson.

63843. Finger rest, Point Hope. E. W. Nelson.

63844. Finger rest, Point Hope. E. W. Nelson.

126812. Ice pick for harpoon. St. Lawrence. E. W. Nelson.

ACCESSORIES TO THE HARPOON.

After E. W. Nelson.

ACCESSORIES TO THE HARPOON.

Besides the hundred and one parts of the harpoon immediately attached to it there are unlimited accessories which have been called into existence at its demands. The hunter has a peculiar costume which he puts on when he goes harpooning. Certain kinds of food are demanded; a multitude of charms and lore are inseparable from the implement. In addition, the hunter takes along several devices to gain information, to decoy the game, and to add to his own comfort. All about the American coast where great fish or mammals existed the water craft were improved immensely. The Nutka dugout canoes and the Eskimo kaiak are unrivaled, and they are the ministers of the harpoon. In like manner the sled, the dog, the harness, the shifting tent owe their forms and usefulness to the ingenious mind which devised and perfected the harpoon, which is no doubt the most virile of all savage inventions.

Sometimes a small implement is used in the hunt to indicate the approach of the seal. It is called qipekutang, and consists of a very thin

Fig. 7.
SEAL INDICATORS.
Point Barrow, Alaska.
Collected by P. H. Ray. Cat. No. 56507. U.S.N.M.
After John Murdoch.

rod with a knob or a knot at one end.[1] It is stuck through the snow, the end passing into the water, the knob resting on the snow. As soon as the seal rises to blow, it strikes the rod, which, by its movements, warns the hunter. Generally it is made of whale's bone. Sometimes a string is attached to the knob and fastened by a pin to the snow, as its movements are more easily detected than those of the knob. The natives are somewhat averse to using this implement, as it frequently scares the seals.[2]

When watching for a seal at his breathing hole, the Point Barrow native inserts into the hole a rod of ivory. When the seal rises, it pushes up this rod and thus warns the hunter when to shoot or to harpoon[3] (fig. 7).

The sealing stool is a small triangular plank with three short legs, on which a hunter squats when watching at a seal hole, where fre-

[1] Parry, Second Voyage, II, p. 550, fig. 20.
[2] Sixth Annual Report of the Bureau of Ethnology, p. 478.
[3] Murdoch, Point Barrow Expedition, p. 255, fig. 255.

quently he has to stand for hours motionless on the ice.[1] Murdoch makes the important statement that this device is not found elsewhere save at the Mackenzie mouth and in arctic Alaska (Robert MacFarlane's notes). Egede describes and figures a "sort of one-legged chair and a footstool." Also Cranz (fig. 81).

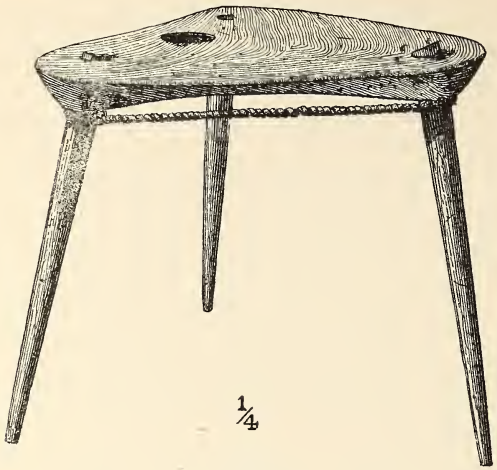



Fig. 8.
SEALING STOOL.
Point Barrow, Alaska.
Collected by P. H. Ray. Cat. No. 89887, U.S.N.M.
After John Murdoch.

Cat. No. 38754 (fig. 9) is an apparatus for joining the two parts of a harpoon line; it may be the leader attached to the line hole through the head or it may be on an extra line used to lengthen the distance between the head and the float. A collection of these from different areas would form an interesting study. The extreme cold of the region, stiffening the line and freezing the hands of the fisherman, makes it necessary to have some device which renders the rapid shipping and unshipping of the line certain and easy. In the example here shown the detacher is carved in the shape of a seal's head. The leader passes through the hole drilled in the neck of the animal, while the line to be attached is looped and pushed through the mouth of the seal, around a stud on top of the head, and hooked. While this attachment is secure enough where there is a steady strain, the hunter has only to push the loop backward, when it relieves itself from the button or stud and can easily be withdrawn. Especial attention is called in this example to the neatness with which the frapping is done on the rawhide thongs, the whale carved on the under side of the

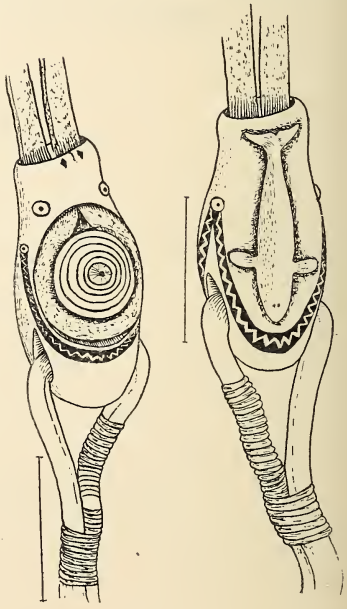


Fig. 9.
LINE DETACHER.
St. Michael, Alaska.
Collected by E. W. Nelson. Cat. No. 38754, U.S.N.M.

[1] Point Barrow Expedition, 1892, p. 255, fig. 256.

object, the curved line or serrate ornament, the owner mark on the back of the head, and the existence of the dot and circle ornament for eyes and on the button or side.

Figures 40 and 41, pages 144 and 145, in Nelson (1900), are good illustrations of this type.

Cat. No. 45060 (fig. 10) in the U. S. National Museum is a seal decoy from Sledge Island, collected by E. W. Nelson. It consists of a handle of pine wood rudely carved at the butt end to resemble the face of a seal, and at the other end into three prongs. Upon each one of these prongs is fitted a toe of a seal so that the three points will touch the same surface. Around each of these is wrapped, by half hitches, a continuous thread of sinew and loops passing around a jog or projection on the end of a stud in the handle just where it is pronged. This stud, of walrus ivory, has carved at the other extremity the head of a seal, the eyes, ears, and nostrils indicated by insertions of black substance like whalebone. The use of this, it is said by those who have traveled in Alaska, is to scratch upon the ice in order to imitate the noise made by the male seal and thereby attract his mate. On hearing the noise above, the seal that is under the ice comes to the breathing hole and is soon dispatched by the hunter.

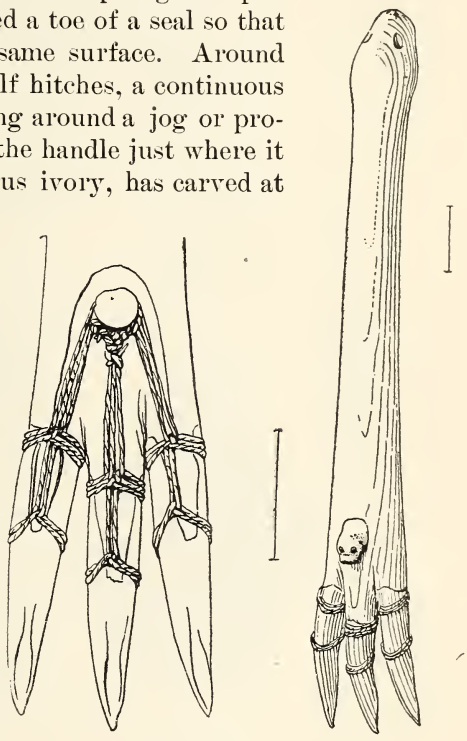


Fig. 10.

DECOY FOR SEAL.

Sledge Island, Alaska.

Collected by E. W. Nelson. Cat. No. 45060, U.S.N.M.

The ice scoop, an accessory to the harpoon, found all over the arctic regions, is shown in fig. 11, *a* and *b*. The first example, fig. 11*a*, is from the Amur region; 11*b* shows a similar device from Cape Nome, Alaska, south of Bering Strait. After the seal is struck with the harpoon down through the small breathing hole, it is necessary to enlarge the opening in order to withdraw the body of the animal. This is done with the pick on the butt end of the harpoon. As soon as the opening is large enough the hunter proceeds to remove the broken ice at once by means of a scoop, the essential parts of which are the handle, the bow, and the webbing. In the example from Schrenk here figured the very primitive way of attaching the spoon to the handle is worthy of notice. The spoon is kite-

shaped in form, the butt ends crossing and lashed to the handle a little above the lower ends, which rest underneath a short bit of wood or across the spoon at either end by means of a rawhide thong. The examples of this apparatus are figured in Nelson, Murdoch, and Boas.

Among the accessories to the harpoon, the throwing stick or board, called atlatl by the Mexicans, must not be omitted. True, the cunning device was used all around the Pacific Ocean and across the Arctic for projecting spears as well as harpoons, and there are other methods of using the harpoon effectively; but the elaboration of the atlatl throughout was greatly stimulated by association with the harpoon. The proper discussion and illustration of this accessory, however, would far exceed the limitations of this article, and will therefore be reserved for a separate paper. A map showing the distribution of the atlatl in the Western Hemisphere would be marked on Greenland, Labrador, Baffin Land, Mackenzie River, all about Alaska to British Columbia, Santa Barbara, cliff dwellings of the Colorado, throughout Mexico, Central America, Florida, Colombia, the Orinoco, and the Amazon on several of its great tributaries, especially in the Mato Grosso.

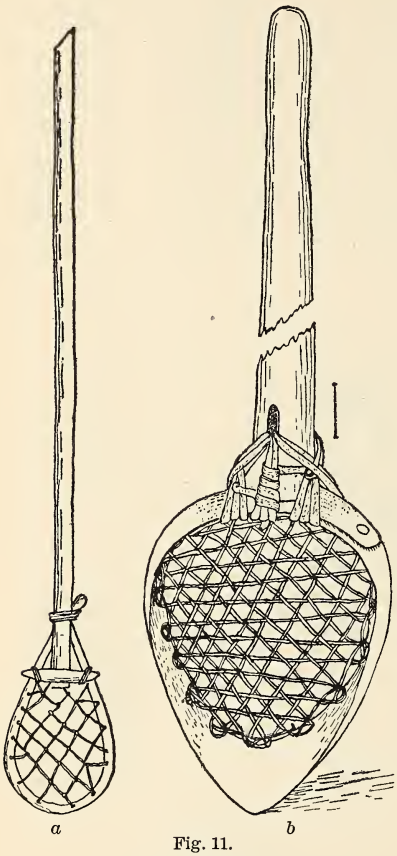
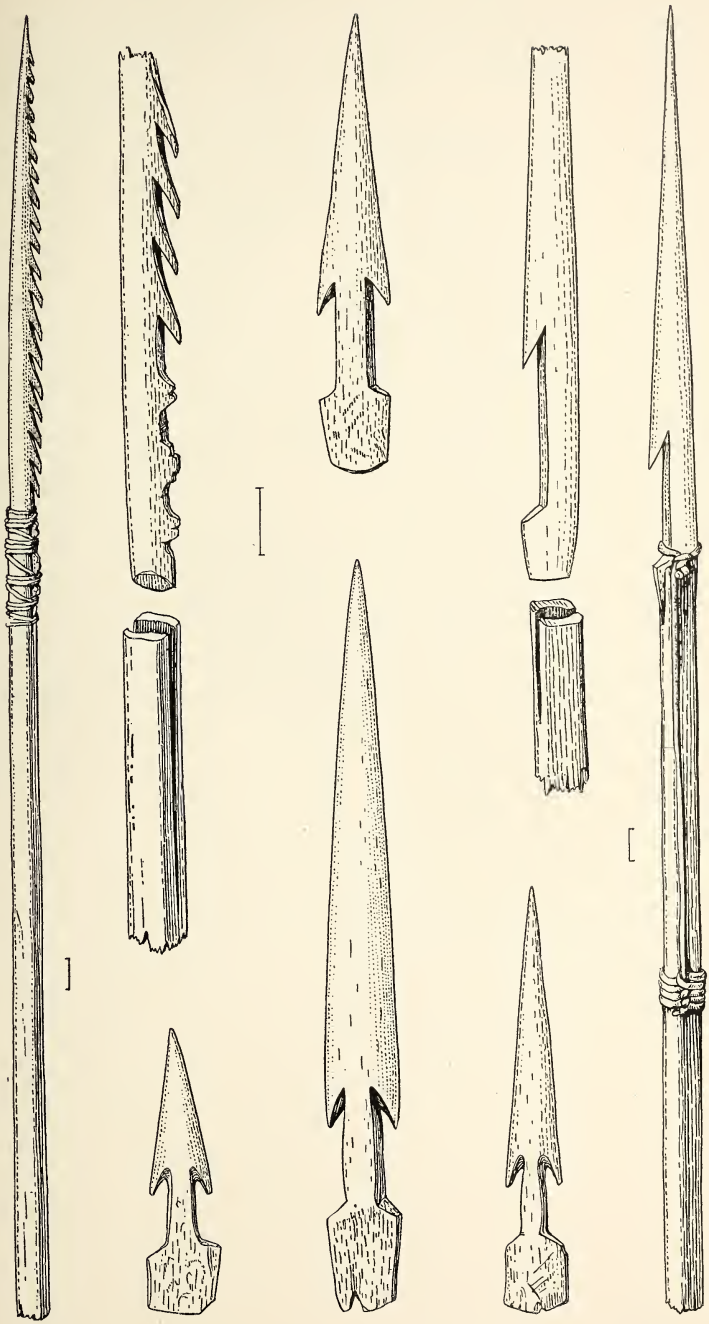



Fig. 11.
ICE SCOOPS.
Amur River and Bristol Bay.
Collected by E. W. Nelson; *a*, after Schrenk; *b*, Cat. No. 45409, U.S.N.M.

## SOUTH AMERICAN HARPOONS.

The continent of South America was not favorable to the harpoon. Most of its shores descend at once into the inhospitable deep sea. Except at its narrow and bleak coast southward, animals best captured with the harpoon did not abound. Inland there were pampas and forests, better suited to bolas, spears, slings, blow tubes, and the bow. It is in the Straits of Magellan, on the west coast, and in the open waters of the great rivers that a rude barbed harpoon and excellent harpoon arrows existed. Nor can the thought be slighted that outside of the favored Cordilleras, the luxuriance of nature overpowered the inventive faculty, which indeed is developed among difficulties so long



FUEGIAN BARBED HARPOON HEADS.

Collected by United States Fish Commission steamer Albatross.

Cat. Nos. 127566, 131217, 131218, 178805, U.S.N.M.

as there is hope, but gives way to despair when nature even by her riches shuts the door against invention. This part of the South American Indian's equipment was not of a high order, since his patent which he received for his cunning was so meager.

*Fuegian type.*—About the Straits of Magellan are three linguistic families of Indians—the Onan, the Alikulufan, and the Yahgan. The first named are believed to be closely related to their neighbors, the Patagonians of the mainland. The other two families make canoes of bark and live on sea products. Their inventions, aside from their ingenious canoes, are not of a high order. Since the days of Magellan, 1520, until now, they have been spectators of Caucasian activities, yet they adhere to their ancient forms and are among the lowliest of the tribes now on the earth.

In the Fuegian barbed harpoons the transition from the spear is immediate, for it is only a matter of a short piece of sinew string or leather thong uniting the head with the shaft. If the barbed head of bone be firmly fixed in the split end of the shaft, the implement is a spear; if the barbed head fit loosely by its butt into a socket or, what is really the case, into the riven end of the shaft, and is joined to the shaft by a short cord or thong, as is shown in fig. 12 (Cat. No. 79091, U.S.N.M.), the implement is the most primitive of harpoons. The transition is not only immediate but easy. When the end of the shaft is merely split to hold the tang of the long bone spearhead, it is impossible to make a rigid joint by any amount of wrapping.

In the examples studied for this paragraph, collected by the U. S. Fish Commission steamer *Albatross*, the spearheads have many serrate barbs on one edge of the blade, and the tangs, instead of being smooth and tapering, are roughly notched to prevent the head from being drawn out of the end of the shaft (Plate 2). In like manner the harpoon heads of bone have tapering points of greater or less length, with two large barbs, one on each side, or one barb projecting near the base. In spears the tang is not fitted neatly into a socket at the end of the shaft, but the latter is merely split and bound with sinew or thong; but the open socket for the harpoon head is wrought with

Fig. 12.
FUEGIAN BARBED HARPOON.
Collected by Thomas and Leslie Lee. Cat. No. 79091, U.S.N.M.

more care. The Fuegian harpoon is thrust with both hands or thrown. It has no hand rest on the shaft to make the blow more effective, nor did these natives have knowledge of the harpoon arrow or the throwing stick, a device prevalent in many other parts of America for propelling the harpoon. The shaft as now seen is a creditable part of the implement, being often 12 feet long and cut out with eight sides rather than round. The thong also is carefully knotted to the shaft a few feet from the barbed head, its length nicely adjusted to the setting of the harpoon for action.

*Chilean type.*—On the Atlantic slope from the Straits of Magellan to the mouth of the Rio Negro, the bow and arrow (formerly), the long-handled spear, but, more than all others, the different varieties of bolas, were the hunting implements. To find the harpoon it will be necessary to cross the Cordilleras and visit the archipelagos of the Pacific coast. Here amidst the greatest abundance, having little contact with Europeans, the tribes of Aucanian and those of unknown affinities plied a harpoon not much in advance of those of Fuegia (fig. 13 *C*). It is to all intents and purposes a good North American arrow, chipped head, foreshaft, lashing crossed over the barbs of the head, and conical base for making a joint with the shaft.

Fig. 13, A and B represent barbed harpoon heads in the U. S. National Museum from Arica, Peru. The heads are of chipped stone set by a tang into a socket in the end of its foreshaft or tang and bound with fine string. The column of the foreshaft is cylindrical, terminating below in a bulb, which serves both to hold the connecting line and to make a loose joint with the shaft.

In the Blake collections, Peabody Museum, is a similar barbed harpoon from Chacota, Peru, with point or blade of stone, tang of wood, and with conical butt end to fit in a socket.[1] Comparing these examples with the Fuegian type, the great advantage which one people may have over another caused by differences of material is apparent. The Fuegian, in order to join the head with the shaft of the harpoon, knows nothing better than to split the front of the handle and make the joining as secure as possible by lashing with rawhide, or sinew cord, which shrinks in drying. Soon, however, this becomes loose again, and makes it necessary to repeat the process of fastening. It is a poor joint at best. As soon as the fisherman, coming northward, discovers the tough and straight cane, a new device is possible, and a better joint. Indeed, nature bores the hole regular in form for the butt end of the harpoon head. By cutting the stem of the cane just above the joint an ideal socket is effected. When the harpoon head is set securely into this socket and the outside wrapped with stout thread, the best of joints is effected. The butt end of all South Ameri-

[1] Eleventh Annual Report of the Peabody Museum, p. 290, fig. 15.

can harpoons, within the area of the cane, belong to the type here shown regardless of tribe or location.

In Stübel, Reiss, and Koppel Kultur und Industrie Sudamerikani-

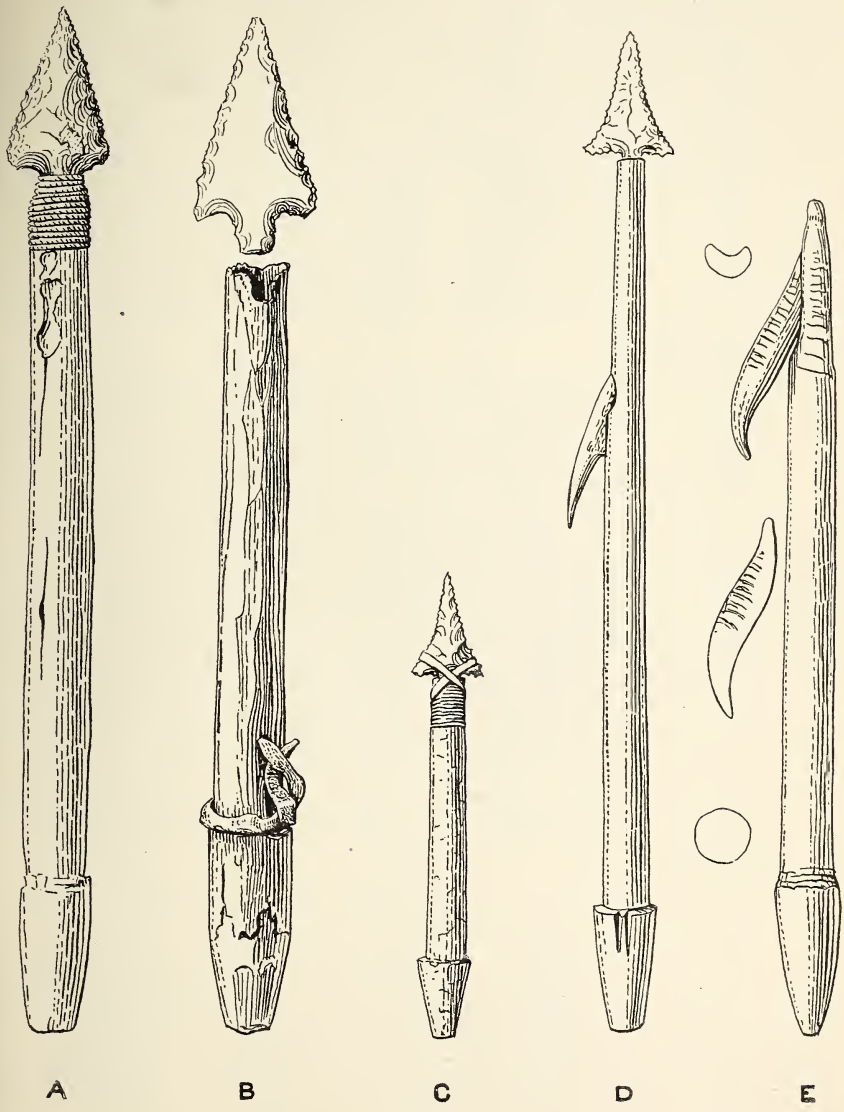



Fig. 13.

BARBED HARPOON HEADS.

Chile and Peru.

A–C, Cat. Nos. 136850*a* and *b*, U.S.N.M.; D, Peabody Museum; E, Charles Read.

scher Völker, is figured a harpoon from Arica, Peru. It consists of a head of syenite and a tang of wood. The stone head is barbed and the tang of wood is fastened with a seizing of woolen cord. At the

lower end of the wooden tang there is a projection for a cord which fastened the head to the upper end of a shaft or reed cane. The lower end of the tang is conical, to fit into the end of the cane. There is a rudeness about the Peruvian and Chilean harpoon heads worthy of attention. The better classes of this ancient people were skillful in many arts. There is in these appliances of capture, therefore, evidence of a humble fishing caste, or of a tribe not identical with Aymaras and Kechuas. The spirit of invention was not entirely wanting in this area, however, as *D* and *E*, fig. 13, show. The last named is taken from Charles Read's paper in the Journal of the Anthropological Institute (volume xix, page 60). Side barbs are set on the side of the wooden tang of the head, partly let in, partly cemented, and in one example served. All the elements here rudely put together will again appear on this same Pacific coast at its northern extremity in their latest elaboration.

In the Hassler collection of the Field Columbian Museum are barbed harpoons from southern Brazil. The bone of an animal forms the point and a barbed piece of hard wood the tang of the head, which is attached by a short piece of rope to the end of the long shaft. In some examples the bone is socketed and set on the end of the tang; in others a spindle-shaped bone is lashed diagonally to the beveled end of the tang. Attention is here specially invited to the bone which forms the body and blade of this head, because it is an ideal, if not the real, beginning of all toggle heads of harpoons. A short piece of bone, conical in form, is cut out so as to be sharp in front and cup-shaped in the rear. If this is set on the end of a hard wood foreshaft and driven into the body of a fish or other animal it remains there and rankles. The arrow shaft is withdrawn, but if the bone be tied to the shaft it becomes a retriever. It toggles in the body of the game. The attachment of spurs at the base of this head brings about the made-up toggle head of the north Pacific coast.

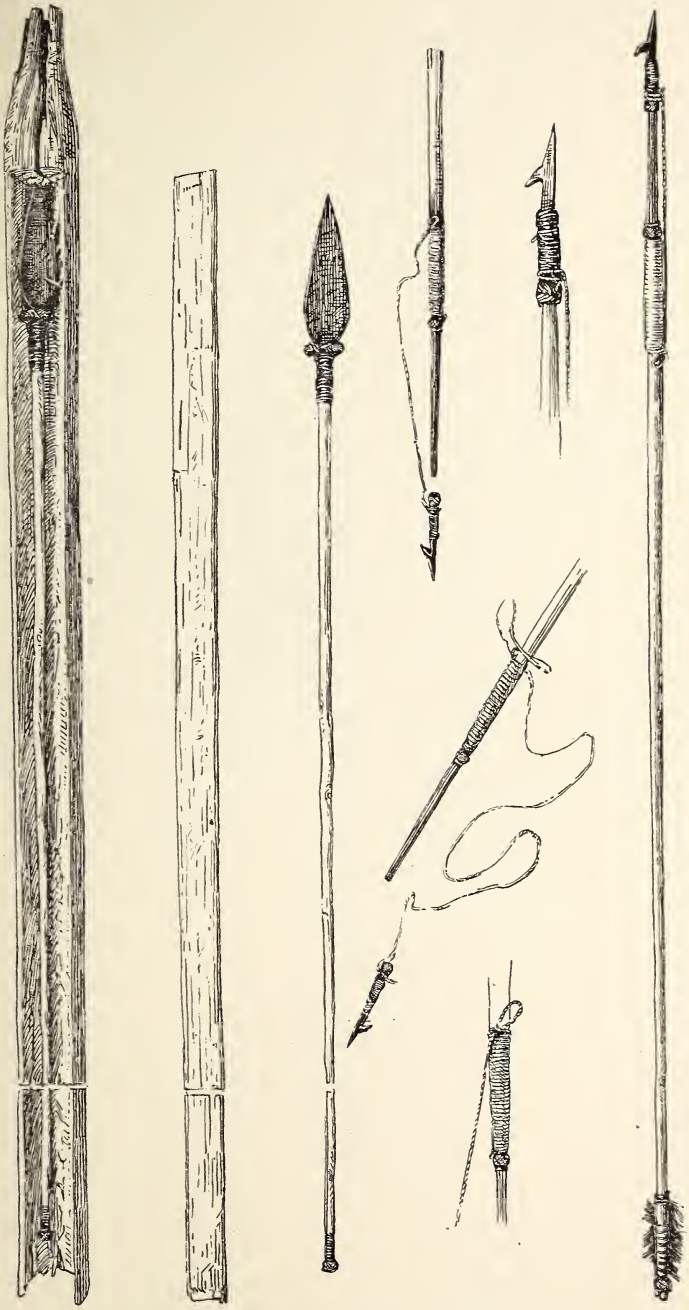
The turtle harpoon arrow in the Solimoens, Brazil, has a lancet-shaped point of steel fitted into a peg, which enters the tip of the shaft. This head is secured to the shaft by a twine of pineapple fiber, 30 to 40 yards long and neatly wound around the shaft. When the blade enters the shell the head of the arrow pulls out and the animal dives to the bottom, leaving the shaft floating. The Indian, on perceiving a movement in the water, shoots his arrow into the air and it never fails to pierce the shell of the submerged animal.[1]

The Amazon Indians hunt the manatee for food in small canoes and kill it with harpoons, the blades of which are made of shells.[2]

The Upper Shingu tribes hunted and fished with bow and arrow, though fishing was sparingly done in this way. The harpoon arrows

[1] Bates, On the Amazons, 1875, p. 293.

[2] Acuña, New Discovery, Hakluyt, No. 24, 1859, p. 69; Bates, loc. cit., 1875, p. 245.



HARPOON ARROW AND SHEATH, VENEZUELA.
Museum of the University of Pennsylvania.

of the Bororo Indians of the headwaters of the Paraguay River, in southwestern Brazil, are used for capturing alligators and large fish. The shaft is of the Uba reed, and at the butt end has two whole feathers laid on flat. The head consists of a shaft of hard wood about 2 feet long, to which are fastened the point and barb, made of a piece of bone or very hard wood, sharpened at both ends, and laid on the top of the foreshaft diagonally so as to form the piercing portion in front and the hook in the rear. The barb is lashed on to the foreshaft by means of a twined string, the other end of which is attached to the shaft, so that when the head is drawn out the shaft itself serves as a buoy. For about 2 feet the outer end of the reed shaft is wrapped with the same cord that connects the reed with the shaft. The inner end of the foreshaft fits into the hole of the reed (fig. 14). Length of this spear, 6 feet. It is pictured in Von den Steinen, 1894, page 484. Among the Bororo (Tupian family) is to be found a modification of this type of harpoon in which the shaft is not fastened to the line but held in the hand of the fisherman, who dives after his game.

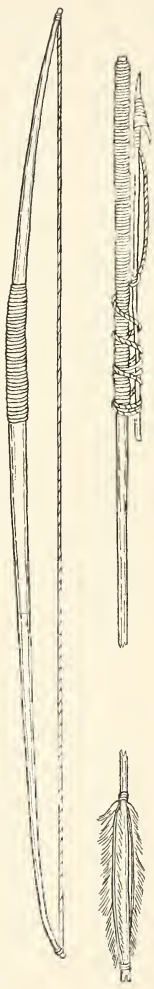


Fig. 14.
HARPOON ARROW.
Bororo Indians, Brazil.
After Von den Steinen.

A harpoon arrow of the Venezuelan Indians is shown in Plate 3. The specimen is in the museum of the University of Pennsylvania. The shaft is of reed, without a joint. At the shaftment there are two half feathers set on radially and held in place by wrappings of black and white thread in alternate bands. In a few places the thread passes over the shaft of the quill, and elsewhere the bands of thread do not touch the feather and have nothing to do with the lashing. At the nock, a ball-like projection is formed by the wrapping of thread. A piece of hard wood is inserted in the notch to fit through the bowstring. At the front end of the shaft a similar object is wrapped around the end to strengthen the socket of the foreshaft, which is a reed of black palm about 8 inches in length, sharpened at its lower end, and driven into the reed. It tapers gradually toward the fore end, where it fits into the head. The head consists of a barbed point of iron and a socket piece or a shank of wood, into which the iron is fitted. At the base of this shank is a short wrapping of twine, mixed with gum, resembling a turk's-head knot. This acts as a stop to the line. The same wrapping extends from the line outward nearly to the barb on the point. The harpoon line, which is 10 feet in length, is

tied around the head at one end and at the top of the shaft at the other end. When this weapon is set ready for action, the barbed head is placed on the end of the foreshaft. The line having been wrapped neatly around the top of the shaft, almost to its end, a loop or slip-knot is formed at the last turn, and drawn tight. When the game is struck, the head is withdrawn, the slip-knot untied, the line unwound, and the heavy portion of the shaft drops into the water, the feather projects into the air, and the apparatus acts both as a drag and as a signal. Excepting the iron point, which might easily be replaced by one of bone, the whole apparatus is aboriginal, and the wide prevalence of this particular combination of parts leads to the belief that we have here an early and unchanged American harpoon arrow. It is interesting also from the point of view before mentioned, that it is a step in the progress of the toggle head. If a Columbia River Indian were to fasten a spur on the end of the cup-shaped socket, the combined barbed and toggle heads, to be more fully illustrated and described, would be realized. This form of harpoon head, in which the socket is on the movable part instead of being in the end of the shaft, is quite well diffused in the Amazon drainage and on the Pacific coast. It is not found in the shell heaps or mounds of eastern United States, but is common in western Canada and universal among the Eskimo.

The harpoon arrows of the tribes in British Guiana are used for shooting fish, pacu (*Pacu myletes*), which abound at all seasons of the year, according to Im Thurn, in most of the large rivers of Guiana. When the river is high and the water is turbid with rain the pacu are distributed equally in all parts of the stream and are almost invisible. When, however, in the dry season, the river is low and the water clear, when the rocks which form the rapids are partially uncovered, and the "pacu grass," a small water plant (*Lacis*), which clothes these rocks, comes into flower, then the pacu collect at the falls to feed on the leaves. Large numbers of Indians then camp at the sides of the falls to shoot these fish. Such a scene is highly picturesque. The place is generally a wide extent of river bed, apparently inclosed by the forested banks, and entirely occupied by a curious confusion of rocks and white, rushing water. On a rock in the midst of, and almost covered by the tumbling water, stands an Indian, his feet crushing the delicate, star shaped, pink flowers of the lacis, and every muscle in his naked, cinnamon-colored body bearing witness to the intensity of his watch. His bow is half drawn, the arrow is in position, but its point rests idly on the rocks. The water is rushing and tumbling so wildly that an unpracticed eye can see nothing below its surface. But the Indian sees. Quickly the bow is raised, the aim is taken, the arrow flies, and its shaft is there, dancing and tumbling in the water, carried here and there by the terrified rushes of an unseen pacu, in the body of which the arrowhead is embedded. But

the line not only connects arrowhead and arrow shaft, but its other end is held firmly in the hands of the Indian, who now easily hauls the fish on to the rock. Sometimes, instead of waiting on a rock, in his eagerness he stands in the midst of the almost overwhelming rush of the water, stooping, the better to resist its force. In either case, if he is skillful, he gets a large number of fish. Im Thurn saw 15 pacu, averaging about 7 or 8 pounds in weight, shot by one man in twenty minutes. When enough have been taken the Indian loads his canoe and returns to his temporary camp. The fish are then cut open and cleaned, their sides are slit again and again, salt is rubbed in, and they are put on the rocks to dry in the sun.

It is not, however, only in the falls that the Indian shoots fish, though he rarely gets pacu elsewhere. In the smooth reaches of the river he shoots others of various kinds. Indeed, he can almost always and everywhere find fish to shoot, and he seldom fails to hit them when they are once seen. When the water is smooth two other fish arrows are used. Of these one[1] differs from the harpoon before mentioned in that a short line connects only the head—which in this case also is slipped on to the shaft—and the shaft, instead of being carried on the arm of the shooter. The struggles of the fish when hit immediately cause the shaft to slip out of the head, and the former, which is very long and light, floats on the top of the water, but remains connected with the fish by the line, and so serves as a buoy and marks the position of the fish.[2]

## NORTH AMERICAN HARPOONS.

Between the northern and the southern continents of the Western Hemisphere the mode of communication was by land or by water. By land the dividing line between North and South America was very near the route of the projected Nicaraguan Canal. The gold-working Chibchas of British Columbia had as their northern boundary the San Juan River. By water there was no partition between the continents. The Caribian and the Arawakan tribes encountered by Spanish explorers all about the Caribbean Sea were also found away southward in the Orinoco drainage and farther. There will be no surprise, therefore, on finding the same devices of capture widely distributed. The same animal will be killed in many places with similar harpoons, because in the struggle for survival among weapons this or that form proved the fittest; also because of that subtle, imaginary kinship between men and animals of prey which encourages the man to follow animals of particular species. The barbed head, with tang fitting into a socket at the end of the shaft, and the socketed head, whose cup-shaped base fits on to a pointed foreshaft, continue to exist with little change until

[1] Im Thurn, Among the Indians of British Guiana, 1883, p. 235, fig. 9*b*.

[2] Idem., pp. 235–237.

California is reached. The barbed harpoon head with cup-shaped base there takes on spurs and becomes a toggle head without barbs.

Of harpoons on the Mosquito coast of Nicaragua and Honduras Squier says:

> The women were left on the beach and three men apportioned to each boat—a paddler, a torch bearer, and a striker. Torches made of pine splinters; spears of two kinds—one (*sinnock*) fixed by a shank at the end of a long, light pole and kept in the hand; the other (*waisko-dusa*) shorter, staff hollow, iron-barbed head, fastened to a line passing through rings by the side of the shaft, wound to a light wood float. When thrown the head remains in the fish, the line unwinds, the float rises to the surface to be seized by the fisherman, who hauls in his fish at leisure.[1]

The same author says that the Mosquito Indians capture thousands of turtles with harpoons.

The Ulva Indians, of Bluefields Lagoon, pursue the manatee. One man sits in the stern of a flat-bottomed dugout (pitpan) to steer, one crouches in the bow with a harpoon, the rest kneel on the bottom, lances in hand. The boat is covered with boughs to resemble floating trees. The man at the bow launches his harpoon, the animal makes a plunge, the boughs are thrown overboard, and the lance men make ready. The bowsman gradually hauls in his line and the animal, after some maneuvering, comes to the surface, where it is stabbed with a lance. After a series of struggles it is secured.[2] These processes of paddling, harpooning, throwing the boughs overboard, hauling in the line, and stabbing with the lance may be carefully noted, in prospect of coming descriptions relating to harpoon work by the Eskimo.

Clavigero describes the Mexican tlacochtli or dart, a small lance of otalli or some other strong wood, the point of which was hardened by fire or shod with copper, or itzli, or bone, and many of them had three points. The Mexicans fixed a string to their darts in order to pull them back again. This weapon was especially dreaded by the Spaniards.[3] The line affixed to the darts is a harpoon characteristic. The three-pronged barbed harpoon head is also to be seen on Lake Patzcuaro at present.

A turtle harpoon[4] of the Seri Indians of Tiburon Island, in the Gulf of California and the mainland adjoining, is shown in fig. 15. It comprises a point 3 or 4 inches long, made from a nail or bit of stout wire, rudely sharpened by hammering the tip (cold) between cobbles, and dislodging the loosened scales and splinters by thrusts and twirlings in the ground; this is set firmly and cemented with mesquite gum into a foreshaft of hard wood, usually 4 or 5 inches long, notched to receive a cord and rounded at the inner end. This rounded end fits into a socket of the main shaft, which may be either a cane stalk or a section

[1] E. G. Squier, Mosquito Shore, London, 1856, p. 74.

[2] Idem., p. 104.

[3] History of Mexico, II, Philadelphia, 1817, p. 166.

[4] W J McGee, Seventeenth Report of the Bureau of Ethnology (1898), p. 187.

of mesquite root, while a stout cord is firmly knotted about the tang of the head and either attached to the outer end of the main shaft or carried in the hand of the user. The shaft is usually 10 or 12 feet long, with the socket in the larger end, and is manipulated by a fisherman sitting or standing on his balsa. On catching sight of a turtle lying in the water, he approaches stealthily, preferably from the rear, yet in such wise as not to cast a frightening shadow, sets the foreshaft in place, guides the point close to the victim, and then by a quick thrust drives the metal through the shell. The resistance between the turtle shell and the metal holds the point in place, and although the head is jerked out at the first movement of the animal, the cord prevents escape; and after partial tiring, the turtle is either drowned or driven ashore, or else lifted on the craft. Dr. McGee quotes the following minute account of Seri turtle capture:[1]

An Indian paddles himself from the shore on one of these by means of a long elastic pole of about 12 or 14 feet in length, the wood of which is the root of a thorn called mesquite, growing near the coast; and although the branches of this tree are extremely brittle, the underground roots are as pliable as whalebone and nearly as dark in color. At one end of this pole there is a hole an inch deep, into which is inserted another bit of wood in shape like an acorn, having a square bit of iron 4 inches long fastened to it, the other end of the tree being pointed. Both the ball and cup are first moistened and then tightly inserted one within the other. Fastened to the iron is a cord of very considerable length, which is brought up along the pole, and both are held in the left hand of the Indian. So securely is the nail thus fixed in the pole that although the latter is used as a paddle it does not fall out.

A turtle is a very lethargic animal, and may frequently be surprised in its watery slumbers. The balsa is placed nearly perpendicularly over one of these unsuspecting sleepers, when the fisherman, softly sliding the pole through the water in the direction of the animal till within a foot or two of it, suddenly plunges the iron into its back. No sooner does the creature feel itself transfixed than it swims hastily forward and endeavors to liberate itself. The slightest motion of the turtle displaces the iron point from the long pole, which would otherwise be inevitably broken and the turtle would as certainly be lost; but in the manner here described it is held by the cord fastened on to the iron which has penetrated its back, till, after it has sufficiently exhausted its strength, it is hoisted on board the canoe by the fisherman, who proceeds to the shore in order to dispose of his prize.

A barbed head, with wooden shaft, together forming a turtle spearhead, is shown in fig. 16, by McGee (1898, p. 193).

The only approach to the harpoon type in all the Pueblo region is an insignificant apparatus for capturing vermin. But the cliff dwellers had the throwing stick, and a spear with a head of stone set on a tang of wood conical at its inner end, like so many found in Peru and Chile. The Yokut Indians (Mariposan family) on Tulare Lake, California, are said by Powers to erect brushwood shelters over the water, in which the Indian lies flat on his belly peering down through a hole.[2] When a fish passes under, he strikes it with his two-pronged

[1] Hardy's Travels, 1829, p. 296.

[2] Stephen Powers, Tribes of California, 1877, p. 376.

harpoon (1877, p. 376). No other region in America illustrates more aptly what has been previously said about the dependence of culture-progress on the bounty of nature. The Tulare women are among the most skillful basket makers in the world, and their ware is sought far and wide. The material is at hand. But the Tulare men have reduced the harpoon to its lowest terms, for two reasons—the animals requiring a better perfected implement are not at hand, and the materials for constructing the weapon are not forthcoming.

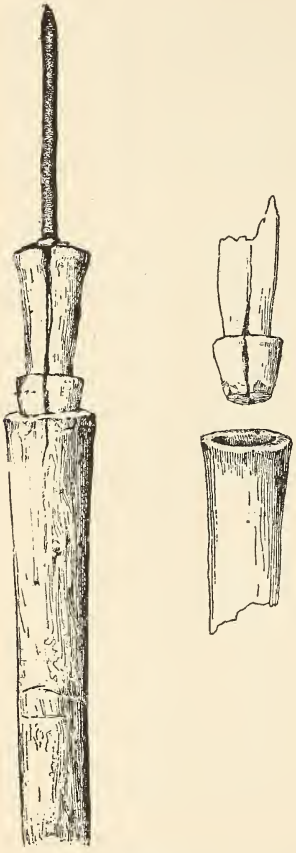


Fig. 15.

TURTLE HARPOON.

Seri Indians.

Collections of the Bureau of Ethnology.
After W J McGee.

The Indians of the Sacramento Valley, in California, not being subjected to the prohibition of the game laws, are allowed to capture game at any season of the year, and when the salmon are in the river to spawn they take them by means of toggle harpoons, one of which is nearly 25 feet in length.

The Sacramento near its head is very swift, and in its passage across different ledges of various degrees of softness excavates large pools or holes in its bed, each having a small fall, and there is a rapid beyond. The water in these holes, which are often very large, is comparatively still, and they make welcome resting places for the tired salmon before they attempt the passage of the rapid above. The water is beautifully cold and clear, and the fish can be seen crowding together on the bottom. The Indians repair to one of these holes to the number of twenty or more. Some station themselves at the rapids above and below; others wade out to an isolated rock, or a log projecting into the stream. All hold their harpoons in readiness, and at a signal from the leader strike. At the first onslaught each manages to secure a fish, which is detached from the harpoon head and thrown on the bank. The harpoons, having toggles of steel which become detached from the stock when they enter the fish, and being attached to the shaft by cords, turn flat against the fish's side and make escape impossible when the salmon is pierced through. Sometimes three or four hundred are thus harpooned from one pool.[1] The Wintun

[1] Hallock, Forest and Stream, VI, June 1, 1876.

Indian ties two poles together near one end, sets them in deep water near the shore, the bottoms a few feet apart; on this he sets a log, one end resting on the shore. From this fishing station he harpoons the black-backed salmon. The shaft is often 15 feet long; the head, a joint of deer's bone, is 3 inches long, with socket to fit on the end of the foreshaft and line tied about its middle. This head is driven quite through the fish and toggles on the other side. The reader can not fail to recall the toggle heads of bone in the heart of Brazil. The Yurok also spear salmon from booths with toggle harpoons.[1] The Wintuns belong to Powell's Copehan family. They are skillful arrow makers and their women dainty weavers of twined basketry. But the abundance of the game as well as its accessibility have acted here, as in all other places, to deter the inventive faculty. The thrusting of a toggle quite through a fish was indeed an effective mode of capture, but it did little to elevate the mind of the captor.

Fig. 16.
BARBED HARPOON HEAD.
Seri Indians.
Collections of the Bureau of Ethnology.
After W J McGee.

The head of the harpoon used by the Nacum Indians of California was made of deer's horn and was about 2 inches long, with a socket on one side that fitted into the pole. When a fish was struck the point left the pole, to which it was attached by a sinew a foot or more long. It has been observed that the toggle harpoon so well known on the Pacific coast of the United States north of San Francisco, as well as British Columbia and Alaska, made no advances as an invention. The Nacum Indians are too far inland to have had the stimulus for improving an apparatu which demands sea room for development.

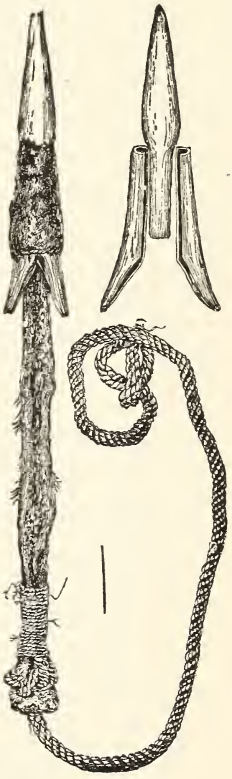


Fig. 17.
TOGGLE HARPOON.
Hupa Indians, California.
Collected by P. H. Ray. Cat. No. 126525, U.S.N.M.

The Hupa and Humboldt Bay Indians construct the toggle heads of their salmon harpoons as follows: A point of antler, bone, or metal from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches in length, more or less flattened and sharp at the tips, is armed at its lower extremity with

[1] Stephen Powers, Tribes of California, 1877. See his index, under fishing.

two barbs laid alongside, lashed down, and covered with pitch. (Fig. 17.) In the same lashing is included one end of the leader, a short strap of deer rawhide. Into a slit at the other end is spliced the line, a piece of rope from 1 to 3 feet long, attached at its opposite end to the side of the shaft. Some spears have two or more prongs, each armed with one of these toggle heads. When the fish is struck its struggles detach the toggle head and it is retrieved by means of the line and pole. Toggle heads of similar type are in use among all the salmon-eating Indians of northwest California.[1]

In the figure shown will be seen the transition of the rankling arrow head of South America into a toggle head. There must be point, barbs, or spurs, line attached between ends, and socket in every harpoon. In this noteworthy type the point and the flukes or barbs are separate, and the socket is ingeniously effected by the combination of point, spurs, and rawhide leader.

The spring salmon, says Gibbs, are taken on the rivers Sacramento, Klamath, Columbia, and Kwinaiutl with a harpoon, the points or barbs attached loosely by a thong, so as to give play to the fish. On some of the rivers, where the depth permits, weirs are built to stop their ascent.[2]

The relationship of weirs, dams, and stops of various kinds with the harpoon may be mentioned in this connection, since the California and Oregon tribes, barred out from ocean fishing by absence of archipelagoes, were compelled to invent equivalents. The old-time harpoon was even then adequate, but engineering schemes were stimulated and so the intellect was quickened. The cooperative results in dam building, strengthening as they did the social tie, are not to be despised. Indeed, Powers, who knew those tribes half a century ago, has much to say about their manliness and resource, both in fishing and hunting. The same will be found true not only on the Atlantic side of the United States but on both sides of South America.

It must not be overlooked that the Pacific Ocean all along the Mexican and Californian coast was no friend to the canoe. Fishing was done inland. The coastal plain, indeed, was the pasture land of vast marine herds that needed no shepherds, but at the proper season they rounded themselves up and proceeded into the various open streams to their spawning grounds, where they were slaughtered without mercy and in such way as to awaken little thought in the minds of their captors.

Cat. No. 131358 in the U. S. National Museum is a barbed head of a harpoon from the Nal-tunne-tunne Indians, Oregon, collected by Rev. J. Owen Dorsey, consisting of an iron arrow head with long sharp barbs on each side and a wooden shank barb piece having two unilateral

[1] Smithsonian Report, 1886, Pt. I, p. 224, pl. xix, fig. 80.

[2] George Gibbs, Contributions to North American Ethnology, 1877, I, p. 195.

flukes (fig. 18). On this wooden shank, the butt end of which fits loosely into the socket of the shaft, is a projection to hold the string connecting head and shaft. This tribe of Indians belong, as their name shows, to the Dené or Tinné Indians, whose home is in central Alaska and the western portion of the Dominion of Canada. This Athapascan family is represented on the Pacific coast also by the Hupa, Wailaki, Saiaz, and many other tribes given by Powell (1891, p. 55). The time of their migration is not known, but extensive movements have taken place since the coming of the whites. They have added nothing to the inventions of the locality. The barbed harpoon blade, with barbs also on its shank, is widespread.

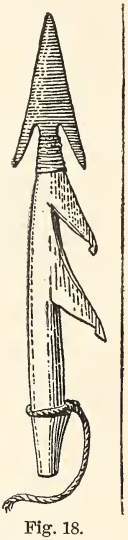


Fig. 18.
BARBED HARPOON HEAD.
Naltunne Indians, Oregon.
Collected by J. Owen Dorsey. Cat. No. 131,358, U.S.N.M.

Sixty years ago Wilkes described harpooning at Walla Walla, on the Columbia River, as very much like that at Willamette Falls, except there is no necessity for planks to stand on. The Indians use hooks and spears attached to long poles, both of which are made to unship readily and are attached to the pole by a line 4 feet below its upper end. If the hook were made permanently fast to the end of the pole, it would be liable to break and the large fish more difficult to take. The Indians are seen standing along the walls of the canals in great numbers fishing. It is not uncommon for them to take twenty or twenty-five salmon in an hour.[1] Wilkes brought home one of their harpoon heads, which is combined barbed and toggle, made up as follows: The head is of iron, triangular in shape, with a large barb on one side. The shank is set in between two pieces of bone, which serve three purposes, namely, to hold the shank firmly, to become two spurs at their outer ends, and to form a socket for the end of the shaft by the hollow between them. The line or leader is laid on the joint between them and the whole lashed securely together and dipped into hot pitch. The line is of many strand braid.

One of the oldest pieces in the U. S. National Museum, Cat. No. 1439, collected by Lieutenant Whipple, is of similar type, only there is not a bit of iron about it. So far as its materials and form are concerned, it might have come down from aboriginal times. The blade is of bone, having two large flukes or barbs on one side cut out. In this example also the spurs at the butt end, which form the toggle, are of bone. The leader joining the head to the shaft is a strap of rawhide. The blade, spurs, and line or leader are neatly joined together with thread and pitch, so as to provide a socket for the end of the shaft.

[1] Charles Wilkes, Exploring Expedition, IV, p. 384.

Those who understand the difficulties which beset the savage artisan in making a good joint will appreciate this efficient combination.

The Twana Indians, of Washington State, make one kind of salmon hook of a straight piece of steel about 6 inches long, and sharp. On each side of it pieces of bone are tied. A line is attached and also a pole 15 or 20 feet long, in such a way that by means of the pole it may be driven into the fish, the pole drawn out, and the hook remain, held by the string, when it is drawn in.[1]

They (the Twana) sometimes use harpoons for seal fishing. The point is of iron, and the spear and line used as with the salmon hook just described.[2]

The shaft of the Quinaielt salmon harpoon is made of cedar, the fork of the wood of the salmon berry; the toggle heads of wood or metal.

Fig. 19.

SALMON SPEAR.

Quinaielt Indians, Washington.

Collected by C. Willoughby.

The loop of cord, which is 16 feet long, is for the left hand. The length of the spear is nearly 16 feet. This spear is used on the bar of the river at low water.[3] This most interesting specimen recalls the heart of Brazil. There a short piece of monkey's bone was pointed in front, while nature formed the socket at the base to fit over the foreshaft. In the Quinaielt specimen the monkey bone is replaced by a combination of bone and metal, the cup-shaped cavity at the base fits also over the foreshaft, but a short line or leader passes from the middle of the head to the fore end of the shaft. This is a full-fledged toggle harpoon of a primitive type (fig. 19).

The Indians of Neah Harbor, says Wilkes, capture the whale with a buoy made of a seal's skin, which is blown up after the manner of bladder, forming a large oblong float. These floats are 4 feet long by 18 inches or 2 feet in diameter, and are made fast by a rope to the harpoon or spear which is thrown at the whale, and becoming fastened to it pre-

[1] M. Eells, Hayden's Bulletin, 1877, pp. 3, 63, 78, 79, 81.

[2] Idem., p. 80.

[3] Smithsonian Report, 1886, Pt. 1, p. 271, fig. 4.

vent its diving down to any great depth. After having a number of these joined to it the animal is unable to quit the surface and is finally captured.

All those whose sealskin floats are attached to the animal now divide the booty. Those who are entitled to a share are easily known, for each float has a different pattern printed upon it.[1]

From Vancouver Island around the interminable coasts of North America to eastern Greenland the float is only in a few places absent from the harpoon in some form. It may be, as in this example, the hide of an immense seal, perhaps of a smaller seal, elsewhere a bladder or intestine inflated. On the coast of British Columbia, in the absence of sealskins, the unconquerable genius of invention substitutes a large bag or wallet of cedar bark, and the Labrador Eskimo attaches a bit of plank to the butt end of his harpoon shaft. The motive is the same. A huge animal, to be captured, must not only be stabbed, but held back by an unwearying device which takes the place of the hunter's hand and arm.

The Makah, living on the northwestern point of Washington State, pursue the whale in their dugout canoes. On one occasion, says George Gibbs, a canoe was gone five days. Their tackle consists of a harpoon, the point formerly edged with shell, now usually with copper, very firmly secured to a line and attached lightly to a shaft about 15 feet long, to which also the line is made fast; a sealskin float is attached to another line and serves to buoy the whale when struck. The scene of the capture is described by eyewitnesses as very exciting, ten canoes being sometimes engaged, the crews yelling and dashing their paddles with frantic eagerness. When taken, the whale, buoyed up with floats, is towed in triumph to the village and cut up.[2]

The Makahs belong to the Wakashan family, whose chief abode is on the outer side of Vancouver Island. They are the Nutkas of Captain Cook and of the early explorers. But in this connection they are at the gateway of the North Pacific archipelago, where, after a lonesome search stretching from Magellan Straits, the student encounters the Caribs of the west. One after another Wakashan, Salishan, Haidah, or Skiddegatan and Tlinket, or Koloschan come out to meet him in their graceful dugouts of cedar.

The Makah whaling harpoon consists of a barbed head, to which is attached a rope or lanyard, always of the same length, about 5 fathoms, or 30 feet. This lanyard is made of whale's sinews twisted into a rope about an inch and a half in circumference and covered with twine wound around it very tightly, called by sailors "serving."

The harpoon head is a flat piece of iron or copper, usually a saw blade or a piece of sheet copper, to which a couple of barbs made of

[1] Charles Wilkes, Exploring Expedition, IV, p. 486.

[2] George Gibbs, Contributions to North American Ethnology, 1877, I, p. 175.

elk's or deer's horn are secured, and the whole covered with a coating of spruce gum. Formerly the blades were of mussel shell. The shaft is made of yew, in two pieces, which are joined in the middle by a very neat scarf, firmly secured by a narrow strip of bark wound round it very tightly. The length is 18 feet; thickest in the center, where it is joined together, and tapering thence to both ends. To be used, the staff is inserted into the barbed head, and the end of the lanyard made fast to a buoy, which is simply a seal skin taken from the animal whole, the hair being left inward. The apertures of the head, feet, and tail are tied up air-tight, and the skin is inflated like a bladder. One example collected by Swan is 3 feet long (fig. 20).

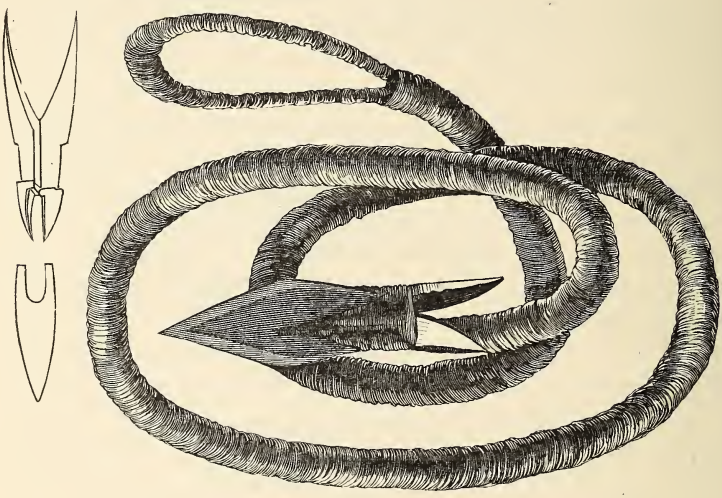


Fig. 20.
TOGGLE HEAD AND LINE.
Makah Indians, Washington.
Collected by James G. Swan.

When the harpoon is driven into a whale the barb and buoy remain fastened to it, but the staff comes out, and is taken into the canoe. The harpoon which is thrown into the head of the whale has but one buoy attached; but those thrown into the body have as many as can be conveniently tied on; and, when a number of canoes join in the attack, it is not unusual for from thirty to forty of these buoys to be made fast to the whale, which, of course, can not sink and is easily dispatched by their spears and lances. The buoys are fastened together by means of a stout line made of spruce roots, first slightly roasted in hot ashes, then split with knives into fine fibers, and finally twisted into ropes, which are very strong and durable. These ropes are also used for towing the dead whale to the shore.[1]

[1] James G. Swan, Smithsonian Contributions, XVI, pp. 19–21.

The Makahs, according to Swan, are not active in vocations or pursuits other than fishing and whaling, and obtain some of their supplies by barter from neighboring tribes and white men. They devote very little time to agricultural pursuits or to the capture of land animals, but excel in the management of canoes, making long voyages from land for fish, and fearlessly attacking the whale. They manufacture their own fishing apparatus, and take especial pains with their harpoons and lances, for which instruments they have the greatest regard. The principal implements used by the Makah whalers are harpoons, lances, ropes, and buoys. The harpoon heads were formerly made of shell, but at present are of sheet copper or steel, with barbs of elk or deer horn, tightly seized to the blades by cords or strips of bark, the whole being covered with spruce gum. The lanyards attached to the harpoon are made of the sinew of the whale twisted into a rope and served with fibers of nettle. The lances are of metal, with sockets for the ends of the poles. The poles for the harpoons and lances are

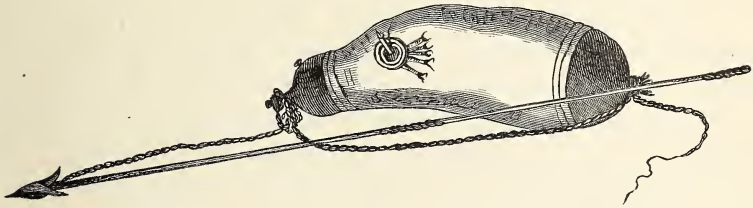


Fig. 21.

SEALSKIN FLOAT.

Makah Indians, Washington.

Collected by James G. Swan.

heavy and unwieldy, but durable and strong. The buoys are of sealskin with the hair inside, inflated when used, and attached to the harpoon lanyards. These buoys are used for the double purpose of impeding the progress of the whale, so as to enable the Indians to kill it, and to prevent the animal from sinking when dead.

All whaling implements which have been used in the capture are regarded with especial favor and handed down from generation to generation, and it is deemed unlucky to part with them. These Indians did not acquire the art of whaling from white men, and still employ the apparatus and processes which have come to them through countless generations. One point deserves especial consideration. The process of wrapping their harpoon lanyards, commonly known as "serving," has been in use by all seafaring men for a number of years. The Makah Indian has his serving stick and mallet, manufactures his twine from the fibers of the nettle, and "serves" his lines as neatly as do the fishermen of the Eastern coast, and it is said they were familiar with the process before the advent of the whites.[1]

[1] James G. Swan, Indians of Cape Flattery.

The implements used by the Makah Indians for catching salmon were a hook and a spear. The former is in size as large as a shark hook, having a socket at one end formed of wood. These hooks are made by the Indians from files and rasps, which they purchase of the traders, and are forged into shape with ingenuity and skill. The socket is made from the wild raspberry bush (*Rubus spectablis*), which, having a pith in its center, is easily worked and is very strong. This socket is formed of two parts, firmly secured to the hook by means of twine, and the whole covered with a coat of pitch. Attached to this hook is a strong cord about 3 feet long. A staff or pole from 18 to 20 feet long, made from fir, is used, one end of which is fitted to the socket in the hook, into which it is thrust, and the cord firmly tied to the pole. When the hook is fastened into a salmon it slips off the pole and the fish is held by the cord, which enables it to perform its antics without breaking the staff, which it would be sure to do if the hook were firmly fastened.[1]

Giglioli figures a barbed harpoon head (Kaheita), made of whale's bone, brought from Nutka by Captain Cook, and now in the Natural History Museum of Florence. It has two barbs on one side and is attached to a line 10 mm. thick, served with twine.[2] This most interesting object, 10 inches long, reduces the harpoon head to its lowest terms. It reminds the student of the Fuegian type, or, better, of the universal American fundamental barbed type. At the base or joint—and this is one of the crucial points for invention—there is merely the rudest kind of pivot to fit into the socket at the end of the shaft. There is no perforation, or even bulb, to hold the line. The shank is simply hacked to make it rough. Some old pieces in the U. S. National Museum, of bone, antler, iron, and copper, collected by Gibbs, McLean, and Fisher, have from one to four barbs on one side, and have line holes or projections for the end of the connecting line.

Ellis says that the Nutka (Wakashan) Indians had two kinds of harpoons—one of bone, the other of shell. The former—that is, the barbed head—is 6 inches long, pointed, having barbs on one side. Of the one with the shell blade, the butt end is "so contrived by means of a socket as to fix upon a pole 10 feet in length. The shaft is forked at the end, so that two pieces of the bone are to be fixed on at the same time." To the shank of the barb a strong line is attached, to the other end of which is fastened a seal skin, blown up. The float is said to prevent the animal from keeping under water. It was dispatched with the lance.[3] This corresponds precisely with the specimens in the National Museum collected by Swan in recent times. In one of his examples the mussel shell, ground to a razor edge, forms the

[1] James G. Swan, Northwest Coast, New York, 1857, pp. 40 and 41.

[2] Appunti intorno ad una collezione, etc., Florence, 1895, p. 131, pl. III.

[3] Ellis, An Authentic Narrative, I, p. 221.

blade, and it is so neatly fitted between the spurs forming the toggle and covered with pitch as to make a sure and efficient weapon. All that the iron did later on was to replace the rather brittle edge of shell, without modifying any other portions of the intricate apparatus.

Marchand's account of the harpoon in Barclay Sound, west side of Vancouver Island, is here given. The strong lance, which may be called their unerring lance, is intended for striking the whale when he presents himself on the surface of the water, and never does an American fail to wound him at the first stroke. Instantly the slighter lances are employed for darting the harpoons, to each of which is fastened one of the long pieces of rope. The other end of the line is fixed to one of those large bladders filled with air. This sort of balloons, floating on the water, cease not to indicate the place where to find the whale, dead or wounded, that has carried with him a harpoon, and the fishermen, directed by this signal, follow him up and celebrate by songs of joy their victory and conquest. But the most difficult is not, undoubtedly, to deprive the monster of life. It remains for them to get possession of him, and it would never be believed, if we were not assured of the fact, that with skiffs so slight and ticklish as canoes hollowed out of the trunk of a tree a few men should succeed in dragging the space of 4 or 5 leagues an enormous mass and contrive to run it on shore on a beach, where they can cut it up.[1] A glimpse at the ethnographic chart of North America shows that the Aht or Nutka division of the Wakashan family occupies the western portion of Vancouver Island, while the coast of British Columbia belongs to the Haeltzukan branch, as shown by Boas. The same author fixes the limits of the Chimmesyan family on the coast between the Koloschan and the Haeltzukan tribes.[2] All about Puget Sound were Salishan tribes, and a small contingent of the same family approach the harpoon area at the mouth of the Bella Coola River.

Harlan I. Smith dug up at the junction of Thompson and Fraser rivers two barbed harpoon heads 9 inches long, made of antler. They have two barbs on one side and a hole for the connecting line.[3]

In a future paper the fishhooks of the same area will be discussed, from which it can be more clearly shown how the idea of the bent finger and its imitators in bone and wood has also dominated the form of the fish spear and the harpoon.

Niblack[4] figures both barbed and toggle harpoon heads among the Haida Indians of Queen Charlotte Islands, British Columbia, a little

[1] Marchand's Voyage, London, 1801, I, pp. 492–493.

[2] Fifth Report of Committee on Northwest Tribes of Canada, British Association for the Advancement of Science, 1889.

[3] Memoirs, American Museum Natural History, New York, II, p. 137, fig. 20.

[4] Report U. S. National Museum, 1888, pl. xxix.

farther north. The barbed heads are of steel. The piercing end of each is lanceolate. The barbed portion is toothed or notched in its entire length, six barbs on the one side and five on the other, alternating. The tang is oval, perforated, and has a small loop or clevis riveted fast to it. Through this is secured a plaited lanyard or loop of seaweed, by means of which the head is attached to the foreshaft or to the main line. Each one of these fits in a cedar case, made by splitting a piece of wood, hollowing it out, and then lashing the parts together, a method adopted by these Indians in their musical instruments and various receptacles.

The toggle harpoon (Cat. No. 88929, U.S.N.M.) of the Haida Indians, figured by Niblack, is still more interesting, being quite similar to the harpoon arrowheads of the South American tribes. The head is of steel, the piercing ends in the form of a spike. At the other end the metal is split open and one portion extended backward for a barb or spur. Just where the spur unites with the body a rawhide line is wrapped to form a shallow socket. Into this the end of the loose shaft fits, being cut off in the form of a wedge at the end. The other end of the loose shaft is widened out to fit into a socket in the end of the shaft. The thong which is wrapped around the head is also securely fastened to the foreshaft at its middle and looped at the other end, to be spliced on to the long line for securing the game. (Cat. No. 88803, U.S.N.M.)

Captain Cook draws attention to the barbed harpoons on Cook Inlet, made of fir, about 4 feet in length. They are mentioned here to mark the northern terminus of the unilateral barb, but they will be described fully later on. One end is formed of bone, into which, by means of a socket, another small piece of bone, which is barbed, is fixed, but contrived in such a manner as to be put in and taken out without trouble. This is secured to the middle of the stick by a strong, though thin piece of twine composed of sinews. These darts are thrown with the assistance of a thin piece of wood 12 or 14 inches long. The middle of this is slightly hollowed for the better reception of the weapon, and at the termination of the hollow, which does not extend to the end, is fixed a short, pointed piece of bone to prevent the dart from slipping. The other extremity is furnished with a hole for the forefinger, and the sides are made to coincide with the other fingers and thumb in order to grasp with greater firmness.[1]

The Chilkotin Indians in western Canada spear salmon with a double-headed toggle harpoon. The shaft is a long pole, upon the inner end of which are spliced two short pieces of wood which serve as foreshafts. The head of the harpoon is made of three separate pieces, the point or spike and two flukes or spurs, all securely lashed together in such a way that a cavity is left in the base for the end of the foreshaft. The

[1]Second Voyage, III, p. 14.

line is tied at its ends around the heads, just above the flukes or barbs, and the middle of the line is securely held in place near the end of the shaft by a lashing of line. When the salmon is struck the toggle is fastened in the animal's body and is withdrawn from the ends of the foreshaft. The short line between the head and the shaft enables the fisherman to play with the victim and to land it more successfully.[1] Similar toggle heads on a bifurcated shaft are to be seen among the Thompson River Indians of British Columbia. This weapon is used for harpooning salmon from the shore while they are running. The handle is 15 feet or more in length and has two prongs securely spliced on to the end of the shaft (fig. 22). The Thompson River specimen is similarly made up of three pieces, the point and the two spurs, but these last do not bend outward, as in the Chilkotin example, but lie close against the foreshaft, leaving a narrow cavity to fit over the end of the latter, which is whittled in the form of a wedge. The line or leader which holds these two barbs to the front end of the shaft is braided, and the ends are caught under the lashing by means of which the toggle is built up. James Teit says that when the fish is struck the barb points are detached, and the fish, with the toggle in its body, is hauled ashore by means of the line. In some forms of the spear the whole foreshaft is detachable. There are also examples in which only one toggle head is used, and there are also spears with fixed heads. In that case the weapon is thrust through the body of the fish.[2] Batchelor figures a similar double-headed toggle harpoon among the Ainu.[3]

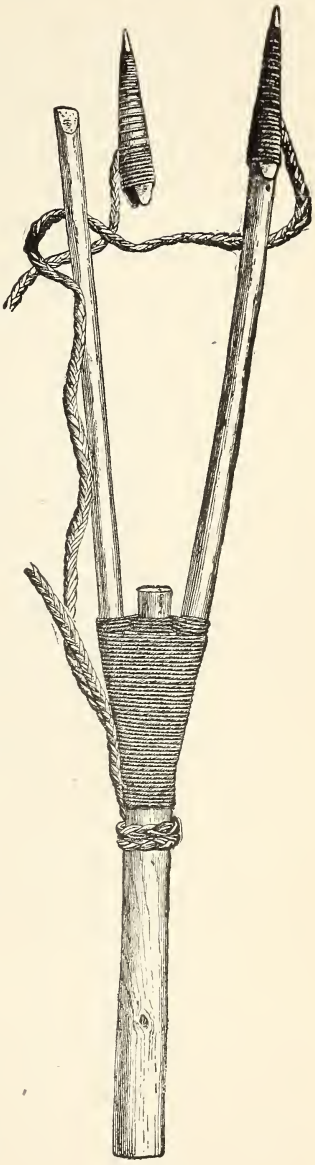


Fig. 22.
TOGGLE HARPOON.
Thompson Indians, British Columbia.
Am. Mus. Nat. History, N. Y
After James Teit.

On the eastern side of North America it will be convenient to begin with Florida. Looking over Mr. Cushing's collections from San Marco, in the south-

[1] A. G. Morice, Notes on the Western Dénés. Trans. Canadian Institute, 1894, p. 71.
[2] James Teit, Thompson River Indians, 1900, p. 251, fig. 231.
[3] The Ainu of Japan, Chicago, 1893, p. 154.

western corner of the State, and Mr. Sawyer's drawings, made at the time they were excavated, does not reveal harpoons; but two varieties of throwing sticks were dug up. Cushing found no barbed heads. It was a great surprise to find the atlatl or spear and harpoon thrower in Florida. In 1895, when Cushing first heard of the wonderful remains at San Marco, Von den Steinen had just revealed the finding of the same implement in the Mato Grosso, Lumholtz and Seler announced its existence in northern Mexico, and the author discovered it in the cliff dwellings of the Verde. Cushing's are the central finger-hole type and the two-holed type for the fore and the middle finger. As the Gulf Stream sweeps past the Orinoco mouth, across the Caribbean sea to Yucatan, and thence in a narrower and swifter current past Florida Keys, one is not surprised to find a Mexican weapon there.

Mr. H. A. Ernst says: "The Seminole Indians of the Everglades now use white man's hooks, but adhere to the old-fashioned harpoon, which is used in catching fish and terrapin." The reader will find abundant evidence of the use of barbed harpoons in the Southern Straits in quotations from Adair, Barker, Bartram, de Bry, and Hennepin. Adair accompanied the Indians killing sturgeons in Savannah River with green swamp harpoons. These are long, sharp-pointed green canes, well bearded and hardened in the fire. When they discovered a fish they thrust into its body one of the harpoons. "As the fish would immediately strike deep, its strength was soon expended in violent struggles against the buoyant force of the green dart. As soon as the top end of the dart appeared again on the surface of the water, we made up to the fish, renewed the attack, and in like manner continued until we had secured our game."[1] These southern harpoons were of the very lowest grade, if they were worthy of the name at all. The motives for devising a highly organized type did not exist.

In Rau's Prehistoric Fishing, barbed harpoon heads are figured. These were taken from mounds, shell heaps, and other remains, from Maine to Michigan. They all belong to the barbed variety, and are of the simplest kind. Three types might be said to exist in Dr. Wilson's collection in the National Museum, the sagittate, in which the barbs are equal on the two sides of the point; the forms with multiple barbs of the same number on either side; those having an uneven number of barbs on the two sides, usually two on one edge and three on the other, and those with any number of barbs on one side, as on the north Pacific coast. At the tang end barbed harpoons are divided into two classes by means of the connecting line which joins the head to the shaft, namely, the notched tang and the pierced tang. These again are further subdivided, for the notch may be only a scratching or roughening of the surface or a bulb, and the piercing may be only a small hole or

[1] C. C. Jones, Antiquities of the Southern Indians, New York, 1873, Chapter xiv.

large opening. About the Great Lakes barbed harpoon heads are plentiful, notched and pierced.

Charlevoix describes the sturgeon spear of the Iroquois fishermen on the Great Lakes. Two men go out in a canoe, one to paddle, the other, in the bow, holding a barbed harpoon dart secured to the canoe by a long cord. Ingersoll compares this to the Columbia River sturgeon chaser. The hook is like a gaff attached to a short wooden socket fast to a line, the other end of which is tied to the canoe. The operation of catching is described by Swan.[1] On the authority of Dr. W. M. Beauchamp the barbed harpoon had a wide variation among the Iroquois and the tribes on the Great Lakes. They are, as regards their barbs, unilateral and bilateral, and as to the tang, notched, bulbed, and pierced. The bilateral and sagittate forms are earlier and in larger numbers. Recent Mohawk, Cayuga, and Seneca sites yield large specimens. Both kinds are most plentiful at the inlet of Onondaga Lake, the outlet of Oneida Lake, and near Chaumont Bay, in Jefferson County. At Brewerton more harpoon heads have been found than in all the rest of New York and, perhaps, than all the eastern United States. It is an excellent place for the work of the harpoon. The large Iroquois harpoon had only a short point. The counties in New York yielding barbed harpoons are Jefferson, Montgomery, Madison, Onondaga, Cayuga, and Livingston. They are found in village sites and camps, rarely in graves, coming out of the ashes, says Beauchamp, in fine order.

Dr. Beauchamp has made a thorough study of the bone harpoon head in the Iroquois country in New York. The reader will have to consult his Bulletin of the New York State Museum to appreciate the endless variety of forms carved out by this quick-minded race. There are pierced, bulbed, and notched bases, unilateral and bilateral barbs, wide and narrow blades, single barbs and multiple barbs, long barbs and short barbs, alternate and opposite barbs. One would require the vocabulary of the botanist for leaves to define the shapes in Beauchamp's figures.

Josselyn tells us that among the New England Indians bass and bluefish were taken in harbors and in the mouths of barred rivers, the fishermen being in canoes and striking the fish with a "fizgig," a kind of dart or staff, to the lower end of which was fastened a sharp, jagged bone with a string to it. As soon as the fish was struck the hunter pulled away the staff, leaving the barbed head in the fish's body, and fastened the other end of the string to the canoe. Thus they hauled often as many as ten great fish to the shore.

Sturgeon were taken in this way at night on the fishing banks, where they were feeding upon small fishes called lances, sucking them out of the sand. The Indian lighted a piece of dry birch bark and held it

[1] Ernest Ingersoll, The Field, London, LXII, p. 413.

over the side of the canoe; the sturgeon, seeing this light, mounted to the surface, where it was slain and captured with a fizgig.[1]

Dr. Fewkes calls attention to walrus-ivory spear points in Nova Scotia similar to those used by the Eskimo. The walrus frequented the coast of Prince Edward Island within historic times. The points are not definitely described.[2]

## ARCTIC HARPOONS.

The Eskimo harpoons are of every variety, barbed or toggle. The dependence of the people largely on aquatic animals for food, dress, house, furniture, tools, and utensils of all sorts makes some kind of retrieving device absolutely necessary. They use the lance also most effectively, but the weak spear, with which the Indian tribes are wont to pick fish from the water, would be of little use among the Eskimo. The variety of animal life, both in size and habit, as well as differences of terrestrial conditions, have stimulated the Eskimo mind to the utmost in devising the most varied additions to what was in the beginning quite simple. Here, also, along the Arctic shore, more than in all other environments of the Western Hemisphere combined, suggestions of improvement have come from without. It is nature's pedagogic institute. More than that, harpoon heads, large and small, of most appropriate patterns, have been made by machinery and traded to the Eskimo by whalers and fur hunters. In this part of the paper the specimens will be described as they occur. The question of the derivation of each feature will then be more easily settled.

A. B. Meyer calls attention to this and says that the little toggle heads of harpoons were not invented in their present form. Semper encountered them among the Negritos of the Palanan, north coast of Luzon, for pig shooting, in the form of harpoon arrows. Meyer describes an example from Bataan, after A. Schadenberg, and figures examples from Palanan and Bataan. All of these have 3-feathered shafts, spindle-shaped loose shafts, attached to both head and shaft by a short line, and iron heads, including both barb and toggle characteristics. The barbs are sometimes at right angles to the plane of the line hole, in other examples in the same plane. In some the toggle head has a conical projection for a socket, the latter being on the end of the loose shaft. Of the last-named pattern the Eskimo examples have no parallel forms.[3]

The Eskimo province may be divided into the following areas or subdivisions:

Area 1. East Greenland, west Greenland, Labrador, and Hudson Bay.

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[1] John Josselyn, Two Voyages to New England, 1674, p. 140.

[2] American Antiquarian, XVIII, 1896, p. 6.

[3] A. B. Meyer, Die Negritos, IX, folio series, publications of the Royal Dresden Museum, p. 14, figs. 1 and 2; pl. VI, figs. 2 and 3; pl. VIII, figs. 1 and 2.

Area 2. The central Eskimo of Boas.

Area 3. The arctic Eskimo, from the mouth of the Mackenzie River, including Point Barrow and Kotzebue Sound.

Area 4. The Bering Sea Eskimo, including Bering Strait southward to Norton Sound, the lower Yukon, Nunivak Island and the mainland, Bristol Bay, and Kadiak.

### EAST GREENLAND HARPOONS.

In this seemingly out-of-the-world location the harpoon is far from its original form. All specimens are toggled and iron enters surprisingly into their composition. Holm (1887) figures the different varieties in his Plates 15, 16, 29, 30, 32, 33.

The hinged lance is here also with shaft of wood, having hand rests on the sides, assembling lines of rawhide to hold the parts together, and foreshaft with flat top, from the middle of which a short cone projects. Some lances have, instead of hand rests for thrusting or hurling from the hand, the throwing stick or ajagsick. The head of the hinged lance consists of three parts, the iron blade (1), set in a shank of ivory (2), and this is fastened into a block of the same material (3), with flat base, in the center of which is a cavity just fitting over the cone on the top of the foreshaft. This block is hinged to the foreshaft by means of elastic rawhide thongs piercing it and the shaft[1] (fig. 23).

The plainest variety of east Greenland has a wooden shaft, with chisel-shaped ice pick at the end. The toggle head is of bone or ivory, with iron blade, flat, cone-shaped body, two line holes quite through the body, united by a groove on the back, into which the line sinks. The shaft socket is in the center of the base, two wing-like barbs flanking it. The complete sealing harpoon is modeled after that of west Greenland, having eyelets instead of hooks for the throwing stick, and being covered all over with little figures of animals, reminding one slightly of the Aleutian hat and the bark onlaying of the Amur people.

The barbed leisters or fish spears, with two or more barbs, are turned by these Eskimo into a toggle arrangement quite unique in America. The piercing ends are of iron or bone and hinged as in a pair of scissors, the cutting end piercing the animal, the other end lying against the shank. When they have entered the flesh these points turn at right angles and toggle.[2] A most curious device is the adaptation of this hinged head to a seal harpoon, provided with a little sled on the fore end of a very long shaft. It will be seen later on that the west Greenlanders use for deep-sea fishing for seals a very long shaft worked by two men, and that the Giliaks make a harpoon shaft nearly a hundred feet long, with a float on the fore end.[3]

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[1] Holm, East Greenland, 1887, pl. xv.

[2] Idem., pl. xv, *a* and *b*.

[3] Schrenk, Reisen und Forschungen in Amurlände, 1881, p. 546.

A harpoon (Cat. No. 168960, U.S.N.M.) from east Greenland, presented by the Copenhagen Museum, is shown in Plate 4. While in general appearance the weapon is similar to those of the same character in southwest Greenland, the head is a type peculiar to the eastern part of the peninsula. The body is of narwhal ivory, conical in outline, a long, lanceolate blade fastened in by means of a rivet. The point of the loose shaft enters directly into the base, which is flanked by two conspicuous barbs or spurs. A strip of iron is riveted across the lower portion on either side to strengthen it. An interesting feature in this specimen is the line hole, which consists of two separate perforations, united on the back with a groove or countersunk cavity to prevent the line from chafing. The loose shaft, which has been neatly spliced at the upper end, has a flat surface at the base, with a projection in the middle, fitting into a cavity on the front of the foreshaft, and the two are tightly hinged together by means of a lashing of elastic rawhide. The use of this joint has been elsewhere explained. The foreshaft is in this specimen a cap of ivory, squared off on top, and the middle left projecting for the socket on the base of the loose shaft. The shaft is of wood, and has on its surface the following attachments: A knob of ivory at the lower end, three hooks or pegs for the throwing stick, one to catch into its base or working end, and two near each other fitting into holes in the manual end of the throwing stick, as seen in the figure. Near these pegs is a hook of ivory, over which fits a catch of the same material on the line, serving to hold the toggle head firmly upon the top of the loose shaft when the weapon is set ready to be plunged into the body of the animal. The throwing stick has a perforation at the working end instead of a peg. The line of rawhide is fastened immediately into the head of the harpoon and has a toggle at the other end to be attached to the line of the float. The other accessories to harpoons of this class are to be seen in Plates 14, 15, and 16 of Holm (1887).

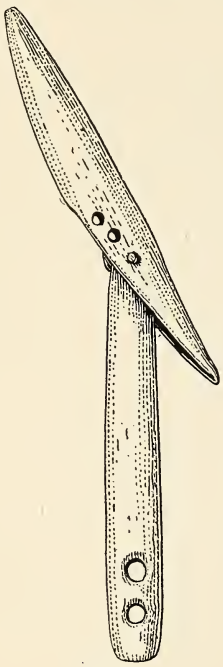
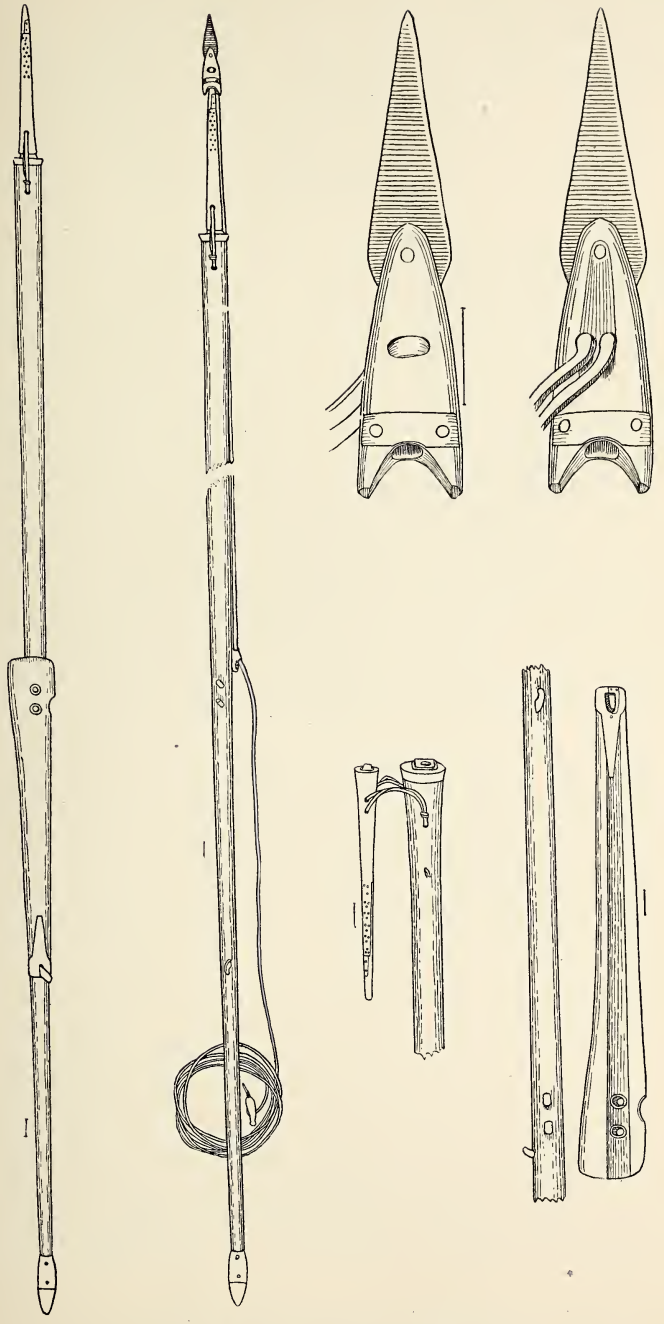


Fig. 23.
HINGED TOGGLE HEAD.
East Greenland.
After Gustav Holm.

WEST GREENLAND.

The oldest accounts of the Eskimo refer to those of Greenland and Labrador, but some of their apparatus remains quite primitive. Again, in a preliminary work like this the area can not be accurately subdivided. The natives themselves are fond of wandering about, and



TOGGLE HARPOON, EAST GREENLAND.

Gift of Copenhagen Museum.

Cat. No. 168960, U.S.N.M.

they leave their ideas as well as their accouterments. The task of discrimination is further embarrassed by the collector's unfortunate habit of labeling a specimen with the name of the place where he procured it, himself frequently not knowing the place of its manufacture. The numbers on the specimens are arranged as they occur in the catalogue of the U. S. National Museum.

Hans Egede, the apostle to Greenland (1721–1736), gives the following description of the harpoon and its uses:

When the Indians of Greenland go whale catching they put on their best apparel, fancying that if they did not come neatly dressed the whale, who can not bear slovenly habits, would shun them. About fifty men and women set out in one of the large boats called kone-boats. The women carry along with them their sewing tackle, consisting of needles and thread, to sew and mend their husbands' spring coats should they be torn, and also to mend the boat in case it should receive any damage. The men go in search of the whale, and when they have found it they strike it with their harpoons, to which are fastened lines or straps 2 or 3 fathoms long, at the end of which they tie a bag of a whole seal skin filled with air; so that when a whale finds itself wounded and runs away with the harpoon it may the sooner become tired, the air bag hindering it from being long under water. When it thus loses strength they attack it again with their spears and lances until it is killed; then they put on their spring coats, made of dressed seal skin, all of one piece, with boots, gloves, and caps, sewed and laced so tight together that no water can penetrate them. In this garb they jump into the sea and begin to slice the fat off all around the body, even under the water; for in these coats they can not sink, since they are full of air, so that they can, like the seal, stand upright in the sea. They are sometimes so daring they will get upon the whale's back while there is yet life in him, to cut away the fat.

They go much the same way to work in killing seal except that the harpoon is lesser, and to it is fastened a line 6 or 7 fathoms long. At the end is a bladder or bag made of a small sealskin filled with air, to keep the seal, when he is wounded, from diving under water and being lost again. In the northern parts, where the sea is frozen over in the winter, the Eskimo use other means. They first look out for holes which the seals make with their claws, about the size of a half penny, that they may catch their breath. After they have found a hole they seat themselves near it upon a chair made for the purpose, and as soon as they perceive the seal come up to the hole and put its snout into it for air, they immediately strike it with a small harpoon to which is fastened a strap a fathom long, which they hold in the other hand. After it is struck and can not escape, they cut the hole so large that they may get the animal up through it, and as soon as they have its head above the ice they can kill it with one blow of the fist.

A third way of catching seals is to make a great hole in the ice, or in the spring they find holes made by the seals. Near to these holes they place a low bench upon which they lie down upon their bellies, having first made a small hole near the larger one, through which they let softly down a perch 16 or 20 yards long, headed with a harpoon, a strap being fastened to it which one holds in his hand, while another, who lies upon a bench with his face downward, watches the coming of the seal, when he cries "Kae," whereupon he who holds the pole pushes and strikes the seal.

The fourth way is this: When the seals, in the spring, are lying upon the ice near holes which they themselves make to get up and down, the Greenlanders, clothed in sealskin, holding harpoons in their hands, creep along upon the ice, moving their

heads backward and forward and snoring like a seal till they come so near them that they can reach the animal with their harpoons and strike them.[1]

The Greenlanders, says Nansen, use two forms of the great harpoon: (1) the Unak, with butt end finished in a bone knob; it is longer and slighter than (2) the Ernangnak, having on its butt end two feathers of bone, commonly whale rib, to increase the weight and guide the flight.[2] The line is made of young walrus (*Odobœnus rosmarus*) or of bearded seal hide (*Phoca barbata*), from 15 to 18 yards long and one-fourth inch wide. The float is the skin of a young ringed seal (*Phoca fœtida*) taken off whole, the hair removed, the apertures all tied up, and the whole dried. The line is coiled on the kaiak stand.[3] He calls the great Greenland and Hudson Bay harpoon, thrown from the hand without the throwing stick, Sigagut. In the work above referred to a spirited description of the harpoon and its accessories will be found (pp. 62–64), with figures.

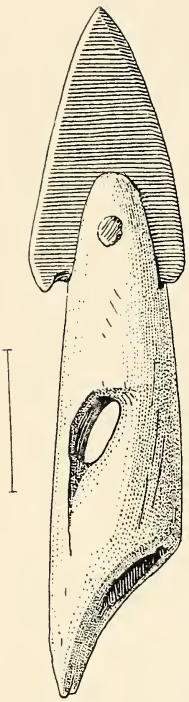


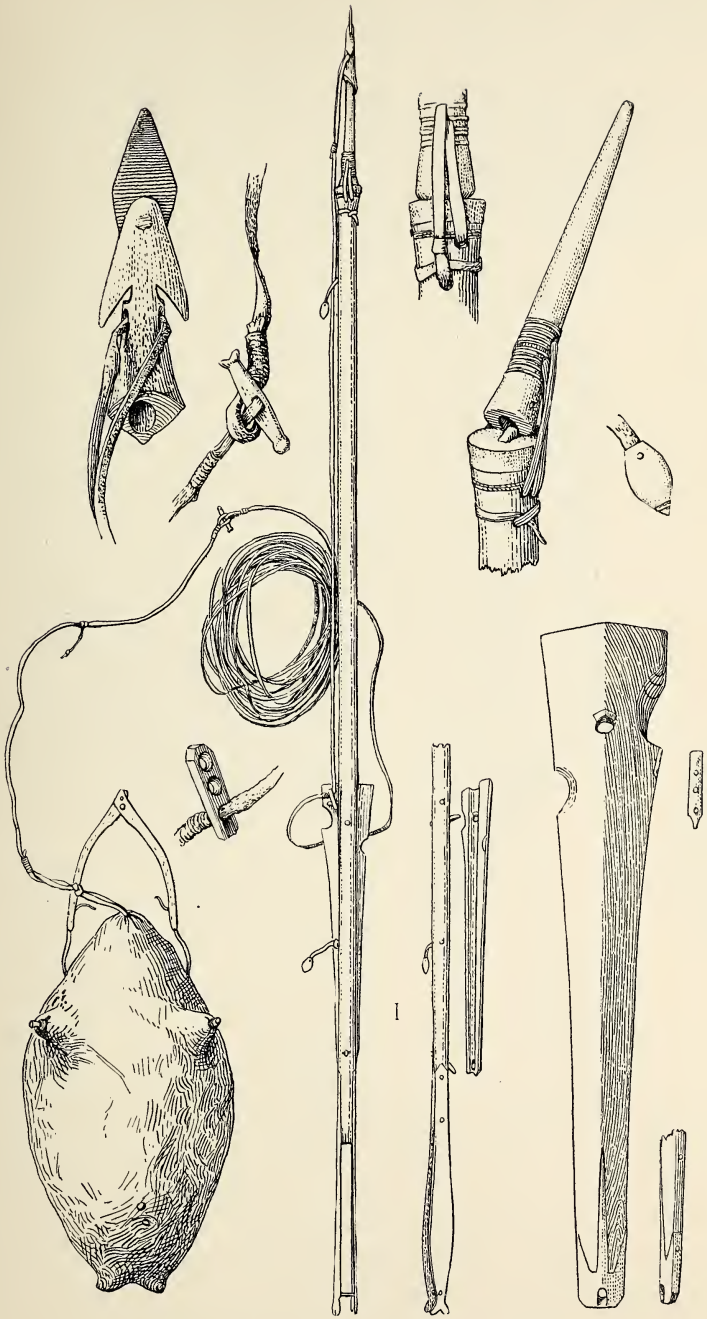
Fig. 24.
TOGGLE HEAD.
West Greenland.
Collected by S. F. Baird.
Cat. No. 9836. U.S.N.M.

Before giving in detail the structure of the western Greenland harpoon, attention must again be called to the difficulty of making neat distinctions. Recent explorations by Peary especially assign Smith Sound material to the Central Eskimo; at least it is intermediate. The constancy of iron in the oldest specimens also demands that no hasty conclusions be drawn concerning the original Eskimo harpoon, either as to its design or ornamentation.

A toggle head from Greenland (Cat. No. 9836, U.S.N.M.), with a triangular blade of iron slightly barbed on one corner, fastened into the slit by a rivet of iron, is shown in fig. 24. The body is conical; the line hole is cut across the body and across the plane of the blade. It is an elliptical opening, and its diameter is not in a line with the axis of the body. It has one spur for a barb, and the socket for the foreshaft is wide and shallow. It is the gift of S. F. Baird.

A modern toggle head of a whale harpoon (Cat. No. 19510, U.S.N.M.), from Greenland, is seen in fig. 25. This unfinished specimen shows the last step in the development of the machine-made toggle head. Everything about the specimen demonstrates this—the mathematical form, the saw cut for the blade, the socket for the foreshaft, the angular barb, and especially the large line hole cut straight across the body of the toggle head. In the primitive examples this last feature cost

[1] Egede's Greenland, pp. 102–106.
[2] Nansen, Across Greenland, 1893, p. 37.
[3] Idem., p. 33.



SEAL HARPOON FROM WEST GREENLAND.

Collected by N. P. Scudder.

Cat. No. 35670, U.S.N.M.

the maker a great deal of trouble. He had to bore two holes slanting toward each other and meeting inside, to unite these by removing the rough surface, and to separately prepare grooves to receive the line. This is the gift of J. H. Clark.

Plate 5 in the U. S. National Museum is a complete seal harpoon from west Greenland (Cat. No. 35670). The head is a combination of barb and toggle, sagittate in outline, with a slender waist and wide base; a very gracefully-made specimen. The blade is rhomboidal, but squared off in the saw cut and riveted with iron. The oblong line hole passes straight through the waist and has slight line grooves.

There are three barbs. Those on the side are angular, prominent, and sawed out, so as to present three flat surfaces inside; the terminal barb angular, formed by the two sloping faces of the back and the beveled surface of the butt; socket for the end of the foreshaft narrow and clean cut. The butt end has no bend or curve in it, but is formed by a single cut in the same plane.

The line is drawn through the line hole, bent, and the end fastened down 6 inches from the toggle head, and held fast by a seizing of sinew three-ply braid, laid on for an inch in half hitches.

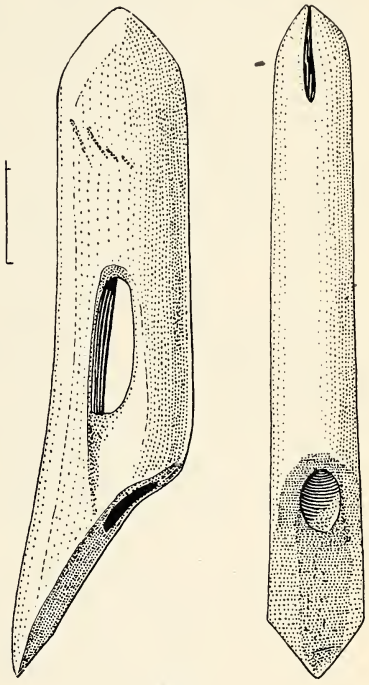


Fig. 25.
TOGGLE HEAD.
West Greenland.
Collected by J. H. Clark. Cat. No. 19510, U.S.N.M.

At a distance of 50 inches from the toggle head is an eyelet of bone, 1½ inches long and half an inch wide, having rectangular outline and pierced with three holes, through one of which the line runs. Just beyond this eyelet is a wrapping of sinew string acting as a stop. The whole line is over 30 feet long and terminates in a toggle of reindeer antler, with a knob at one end and a bifurcation at the other end. This is to hook into a loop in the line of the float, to be now described.

The hide of a young seal was drawn off over the neck, care being taken to keep the legs and other parts complete. After being turned right side out, the hide was sweated, depilated, and again turned wrong side out and all openings carefully fastened up air-tight. But into the puckered orifice of the neck a stout rawhide loop was inserted and made fast and into one forefoot a bone mouthpiece was firmly lashed. About

this specimen, as on many other floats, little holes were stopped by studs of wood or hard animal substance, set in when the hide was green, which, shrinking, renders the joint perfectly tight. As mentioned, into the puckered neck of the float was knotted a bend or loop 6 inches long. This would serve as a handle and be inseparable from the float. A stout piece of rawhide line, 3 or 4 feet long, was bent to form a loop at each end. Into one loop the float-loop was spliced, and into the one on the other end of the line the toggle of the harpoon line hooks. The bends in the ends of the short float line are seized down by means of sinew braid in half hitches. The float is always associated with the kaiak, and therefore it has attachments for it, as well as for the line. In the end of the float, where the float loop is fastened, and on either side of the latter, two short rawhide lines are inserted and made fast on the inside. These short pieces are run into the ends of a device, made from two pieces of antler, for slipping under one of the cross lines on the deck of the kaiak. For this purpose a hole was bored up in the end of each one of these pieces 1 inch, met by a hole bored half way in at the side, and half an inch above another hole was bored quite through. The line from the float is drawn up the hole at the end, out at the meeting hole, and through the upper hole, where it is fastened with a peg, the two holes being united on the outside by a countersink to prevent abrasion by ice. A wooden peg wedges the line fast in the inner hole. The two front ends of the pieces of antler are united by an iron rivet. These details are mentioned to call attention to the cunning makeshifts of savages working with the poorest tools. The maxim, "Where there's a will there's a way," is quite true among the Eskimo.

The shaft is a typical Greenland form and consists of loose shaft and rawhide hinge or connecting line, foreshaft, shaft, and "feathers."

The loose shaft is an elongated cone of ivory 7½ inches in length, having at a distance of 1 inch from the butt a raised ornament of rings and bands turned as in a lathe, the middle band with cross ridges. Two holes are bored, one above the other, through this ornament, and three holes through the fore end of the wooden shaft for the rawhide thong that forms the elastic joint between loose shaft and foreshaft. This thong is doubled at its widest end and the whole drawn through one of the shaft holes, not tightly; it passes (1) through the lower hole of the loose shaft, (2) back through a hole in the shaft, (3) up through the outer hole in the loose shaft, (4) back through the loop in the first end, then through the third hole of the shaft and once wrapped around, the end being tucked under as in making a single knot after the whole is drawn as tight as possible.

The base of the loose shaft is squared off and socketed. The foreshaft is only half an inch long, but forms an ellipse 1½ by 1¼ inches in diameter. It has a pivot or projection on top to fit into the socket of

the loose shaft and is excavated below to fit over a tenon in the end of the wooden shaft, which is kept from splitting by a wrapping of sinew twine.

The shaft, of pine wood, 5 feet 2 inches long and 1⅛ inches thick, tapers somewhat toward the butt end. Upon it are the following additions: Buttons for holding the shaft on the kaiak, peg over which the eyelet on the line catches to hold the head on the loose shaft, two pegs for the throwing stick, and bone feathers.

The buttons for holding the apparatus on the kaiak are two little almond-shaped bits of ivory, attached to the shaft near either end by means of a short rawhide thong. These buttons are tucked under the cross lines on the deck of the kaiak, but on occasion do not offer any ratchet to prevent withdrawal. The throwing stick pegs for the two holes in that apparatus are of bone and extend quite through the shaft near either end. The west Greenland shaft for the seal harpoon is unique in having the pegs on the shaft and not on the throwing stick.

The butt end of the shaft is squared for the attachment of the two "feathers" carved from whale's bone. The end of the shaft is beveled off and grooved.

It must be borne in mind that as a rule the North American Indians have three feathers on their arrows, radiating outward; the Eskimo have two, laid flat on the flat shaftment. Now on the west Greenland smaller harpoon, at either side of the butt, is a strip of whale's bone 16 inches long, from 1½ inches wide, and one-eighth inch thick, both exactly alike, with long leaf-shaped outline terminating in a fish-tail bifurcation. These two plates are pegged on for 5 to 6 inches, so that their outsides are flush with the shaft, and their butt ends are held apart in place by an ivory peg or cylinder. The area of this device or attachment is very circumscribed. It is not shown by Boas, Kumlien, or Turner. The throwing stick is of light, coniferous wood, very broad in the manual part and tapering gracefully toward the working end. The top is slightly rounded up, the bottom of two surfaces meeting in a ridge along the middle. The shaft groove is an inch wide and from one-fourth to one-eighth inch deep, extending the entire length of the piece. It is right-handed, having a deep under-cut notch on the left margin for the thumb, just back of which on the margin is a pretty bit of bone pegged on. The hole in the manual part for the peg has in front of it a washer of bone set in to prevent the peg from wearing the hole larger. Into the working end of the throwing stick is neatly set a T-shaped bit of whale's bone, held in place by pegs quite through both bone and wood. At the outer end of this bone is a large hole slanting forward and into it the rear peg on the shaft fits. When pulled straight ahead the hook holds firmly, but when the throwing stick begins to turn away from the shaft the hole unhinges from the peg. All this action with least resistance is provided for in the device. Collected by N. P. Scudder.

A flat toggle head (No. 45855, U.S.N.M.) with a gibbous section has the back more compressed than the belly. The front end is rounded, the blade slit not deep, and rivet hole large. The line hole is curved upward and has deep line grooves. Barbs, two on the outer margins, formed by a slightly incurved cut into the butt end. The butt is whittled away so that the toggle head is just as long on the belly as on the back. Length, 3 inches. Gift of the Copenhagen Museum. Example 63951, gift of Governor Fenckner, is somewhat similar, but the back is longer and the notch between the tips of the barbs is not angular.

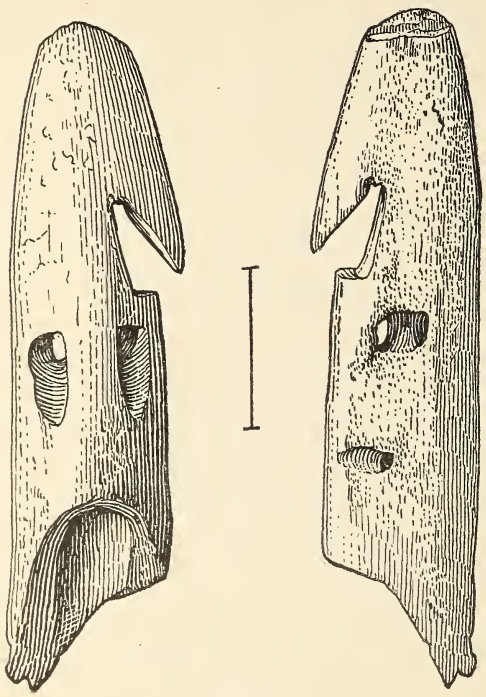


Fig. 26.

TOGGLE AND BARBED HARPOON HEAD.

West Greenland.

Gift of Copenhagen Museum. Cat. No. 45883, U.S.N.M.

Example No. 45670 in the U. S. National Museum is the point of a large harpoon from Greenland. The blade, of iron, was inserted in a saw cut in the end of the shank and riveted with iron, now decayed by rust. The shank, of whale's rib, is rectangular in the section at the front and circular in other parts. Between the rectangular and circular portions are four barbs. At the angles the butt end is conical to fit into a socket. In the end of the shaft, 3 inches above, two holes are pierced for the insertion of a thong forming a hinge between the loose shaft and the shaft. Total length, 15¾ inches. Gift of the Copenhagen Museum. No. 63939 is a broken and unfinished specimen of the same type.

Example No. 45872 in the U. S. National Museum is the loose shaft and point of a barbed harpoon combined, from south Greenland. The front end is furnished with two barbs on one side and the top is pointed. The butt end is cylindrical to fit into the foreshaft, and 2 inches above it are three holes bored for the rawhide thong which attaches this part to the shaft. The noticeable feature in this old piece is the presence of the barbs on the loose shaft and the entire absence of toggle attachments. Length, 14 inches. Gift of the Copenhagen Museum.

Fig. 26 is a combined toggle and barbed harpoon head from western Greenland (No. 45883, U.S.N.M.), all in one piece of antler. The body is narrow and flat, the spongy part of the material being the back of the implement, while the belly, which takes the strain of the line, is the outside hard portion of the antler. For a blade, the fore end was sharpened to a point. There is no evidence of a metal blade having been used in this head. The line hole is formed by two slanting holes meeting on the back of the body, so as to leave a small opening on the back, a feature not common in Greenland specimens, but observed in many from the Amur region (Plate 7). The line grooves extend only half an inch backward, and then suddenly terminate. Originally there were doubtless three barbs; one, a strong hook on the left-hand margin between the point and the line hole, and two barbs at the butt, spread out like a fish tail, the tips being cut in an ornamental manner (see Plate 8, from Von Schrenk). The socket for the foreshaft is only three-fourths of an inch deep. The butt end is cut off with a long bevel, steep on its lower half and sloping more and more outward. Length, 4¼ inches. Collected by Dr. Emil Bessels, but special locality not given.

A toggle head of bone from western Greenland (No. 45884, U.S.N.M), conoid in form and double convex in section, is shown in fig. 27. The blade, which was of metal, is wanting, and the blade slit is wide for such a small specimen, the rivet hole neatly bored. Line hole, of two cone-shaped cavities, meeting in the body of the implement, and having slight line grooves. There is but one barb, pointed on the back, a little to the right-hand side of the middle. The socket for the end of the foreshaft is cone-shaped. Length, 2½ inches. Gift of the Copenhagen Museum. This specimen, though exceedingly plain in shape, does not mark an early form of toggle harpoon head, but a later period, when they were made in great numbers, sometimes by machinery, and sold to the Eskimo, who found it easier to provide themselves in this way than to make them by their rude tools.

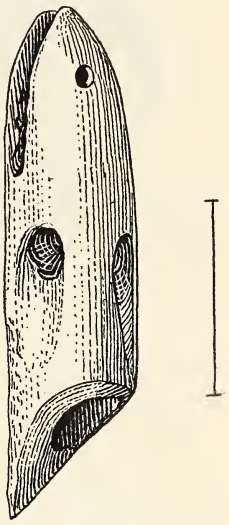


Fig. 27.
TOGGLE HEAD.
West Greenland.
Gift of Copenhagen Museum.
Cat. No. 45884, U.S.N.M.

An old toggle head of a harpoon from north Greenland (No. 45885, U.S.N.M.), collected by Emil Bessels, is shown in fig. 28.

The body is of bone, the back nearly flat, being the soft part of the material, and the belly, which is more rounded, is of the outer, hard part of the bone, this being necessary in order to take the strain of the line.

The blade in this example is missing, and was inserted in a saw cut at the rounded end of the body and held in place by a rivet.

The shaft socket is a conical hole centered between the back and the front surfaces and flanked by barbs whose points are formed by the meeting of the back, the belly, and the socket or excavation in the rear for the foreshaft.

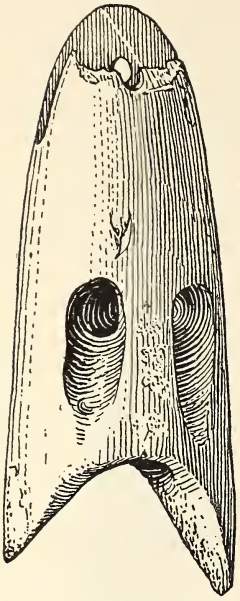


Fig. 28.
OLD TOGGLE HEAD.
North Greenland.
Collected by Emil Bessels. Cat. No. 45885, U.S.N.M.

The line hole is formed by the meeting of two holes bored in from the under side and not quite through to the top. Line grooves project backward from the line hole so as to render all smooth to prevent the thong from chafing. Length, $2\frac{7}{8}$ inches.

A combined barbed and toggle head (Cat. No. 45886, U.S.N.M.) from west Greenland is shown in fig. 29, and is a gift of the Copenhagen Museum. The body is of bone, the back being formed of the hard or outside portion. The kerf for the blade is wide, and the latter, missing in this specimen, was fastened in with a rivet. On either side of the blade are two marginal barbs, cut out squarely as with a saw; from the tang of these barbs the body widens out to the tip end of the spur or flukes. The line hole is formed by two distinct conical bores, which meet at their inner extremities, forming at the same time a continuous cavity and line grooves. The butt is bifurcated, and the cavity for the end of the foreshaft seems to have been bored out after the barbs were formed. This fine old piece is worthy of note in that both types of harpoon head, the barbed and the toggle, are preserved. The specimen represents also what Murdoch considers to be the original form, since the barbs, the blade, and the line hole are in the same plane, while in the better and more improved varieties the blade is set in at right angles to the line hole.

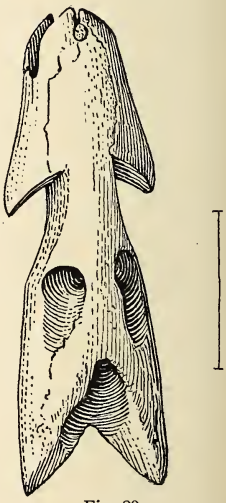


Fig. 29.
OLD BARBED AND TOGGLE HEAD.
West Greenland.
Gift of Copenhagen Museum. Cat. No. 45886, U.S.N.M.

A barbed harpoon head of bone (Cat. No. 45887, U.S.N.M.), all in one piece, from northwestern Greenland, is shown in fig. 30. It is

shaped like a barbed and tanged arrowhead, with a line hole through the tang in the plane of the blade. The tang abuts squarely on the end of the shaft and the front of the blade is sharpened to an edge. The barbs are not of equal length. Length, $1\frac{3}{4}$ inches; width, $1\frac{5}{16}$ inches. From Greenland. Collected by Dr. E. Bessels.

Cat. No. 45888 (Fig. 31) is a barbed head of whale's rib, but there is not enough remaining to indicate whether it had toggle attachments. Length, $4\frac{1}{4}$ inches. Gift of Copenhagen Museum.

These old pieces are most interesting connecting links between the simple barb and the toggle head. They might be named conservative harpoon heads, which, while trying the new device, can not at once lay the old barb aside.

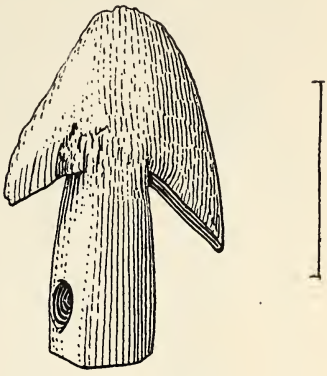


Fig 30.

BARBED HARPOON HEAD.

Northern Greenland.

Collected by Emil Bessels. Cat. No. 45887, U.S.N.M.

Fig. 31.

OLD HARPOON HEAD.

North Greenland.

Gift of Copenhagen Museum. Cat. No. 45888, U.S.N.M.

A toggle harpoon head (No. 45889, U.S.N.M.) from western Greenland, made of bone all in one piece, is shown in fig. 32. It is double convex in section and the point is formed by shaving down the faces of the body. The line hole passes through the bone in a direction perpendicular to the plane of the blade, and the single barb is formed by beveling the end. The line grooves are slight, and the cavity for the shaft large, its margin continuous. Length, $5\frac{1}{2}$ inches; width, one-half inch; depth, fifteen-sixteenths inch. Gift of the Museum of Ethnology, Copenhagen. An entirely aboriginal form, with no metal about it. From this it is not to be inferred that the piece antedates the coming of the whites.

The loose shaft of a toggle harpoon (Cat. No. 45893, U.S.N.M.), made of wood, from south Greenland, deserves consideration. It is spindle-shaped, elongated on one end, and short at the other, elliptical in cross section. Through the thickest portion two holes are bored for the rawhide thong which unites it to the shaft. Examples of this part of the harpoon in wood are very rare. Length, $9\frac{1}{2}$ inches. Gift of the Copenhagen Museum.

An ancient barbed and toggle harpoon head (Cat. No. 45910, U.S. N.M.), made from a bit of hollow bone, from northern Greenland, collected by E. Bessels, is shown in fig. 33. The point has been cut off so that it is impossible to say how the blade was set on. The barbs on the margin in front of the line hole have been cut out squarely but their points have evidently been reduced. It is possible, however, that their present form represents nearly the shape of the original material. At this point it is proper to make an observation which applies very largely to the forms of aboriginal implements. The savages understood how, in an emergency, to secure the largest amount of result with the least amount of effort. It is with inventions as with language. A long word is not employed when a shorter one will suffice, and a servile imitation of any type specimen is not attempted when the result can be reached more directly. Hence, while objects of a certain class resemble one another in general, no two are alike in detail. The line hole is cut through the soft part of the bone by two conical perforations meeting in the middle, and the line grooves appear to have been made by the same instrument. The back of the body of this toggle head is very hard bone, and the spur bends upward and outward, following the natural curve of the material. The base is cut off by a nearly plane surface. The socket for the foreshaft is a cylindrical hole bored straight into the bone from the rear, apparently with an instrument of iron. It is not conical as in the great majority of Eskimo harpoon heads.

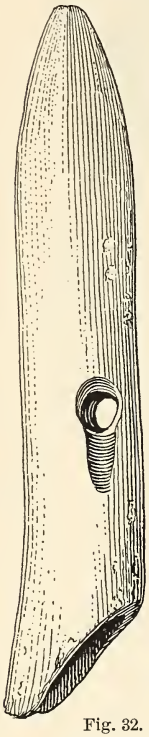


Fig. 32.
TOGGLE HEAD.
West Greenland.
Gift of Copenhagen Museum. Cat. No. 45889, U.S.N.M.

Fig. 33.
OLD BARBED AND TOGGLE HEAD.
West Greenland.
Collected by Emil Bessels. Cat. No. 45910, U.S.N.M.

A toggle harpoon head, made of antler (Cat. No. 45947, U.S.N.M.), from north Greenland, the gift of the Copenhagen Museum, is shown in fig. 34. It is in the form of a flat cone with convex sides. The kerf or saw cut is wider than in the more modern examples, because the blade was of stone and held in place by a rivet of bone. The line hole is most primitive

and interesting, being formed, not by a sloping cavity, but by means of a drill. The socket at the base is also conical, opening into the line hole, and two barbs of equal size are formed by cutting away the material of the back. This bifurcation is found on many Greenland specimens. Those who are acquainted with the Eskimo handicraft in localities where steel tools do not abound are interested to note what free and varied use these natives make of drills of different sizes. There are twenty examples of boring on this little toggle head, for the rivet, for the line hole grooves and socket, and besides for mending a crack in the material. For this last purpose we have not only perforations for the sinew mending, but gutters bored one twenty-fourth of an inch deep, into which the cord was countersunk. This will be better seen by an examination of the illustration.

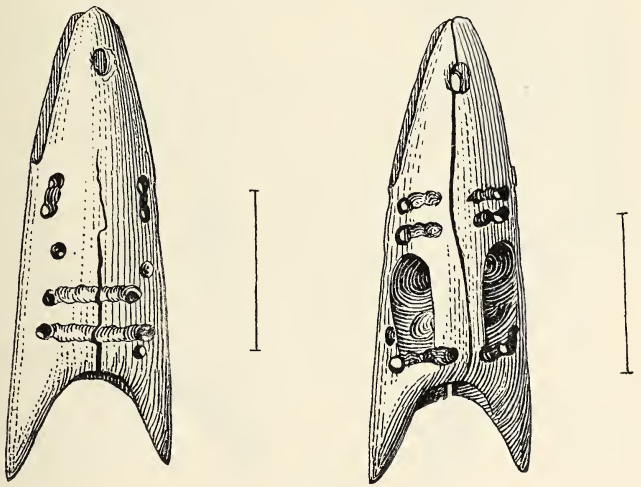


Fig. 34.

OLD TOGGLE HEAD.

North Greenland.

Gift of Copenhagen Museum. Cat. No. 45947, U.S.N.M.

The point of a barbed harpoon (Cat. No. 63938, U.S.N.M.), from Greenland, must be mentioned. The point is arrow-shaped, symmetrical, with two barbs. The tang is spindle-formed, with a cone at the butt end and pierced in two places for the insertion of the line connecting with the shaft. Length, 5¼ inches. Gift of Governor Fenckner.

Similar to this is Cat. No. 63937, U.S.N.M., an old specimen from the same locality. These examples have their counterpart in the numerous points of the small barbed seal harpoon of the western Eskimo.

An old barbed and toggle harpoon head (Cat. No. 63940, U.S.N.M.) from west Greenland, the gift of Governor Fenckner, is shown in fig. 35. The material is bone. The blade is wanting, and the blade slit has been cut away. There are three rivet holes, and one of them,

seen on the right side of the left-hand figure, is double. The barbs on the margin are cut out square, as with a saw, but the sides of the tang are curved in, leaving shoulders at their base, from which point the body curves outward to the end of the spurs. The line hole is formed, as in most examples of this kind, by two independent conical bores which meet at their inner point. Line grooves are connected with these. The base is not cut off in a plane surface, but has the appearance of being scooped out, beginning on the under side with a perpendicular surface, which slopes more and more toward the

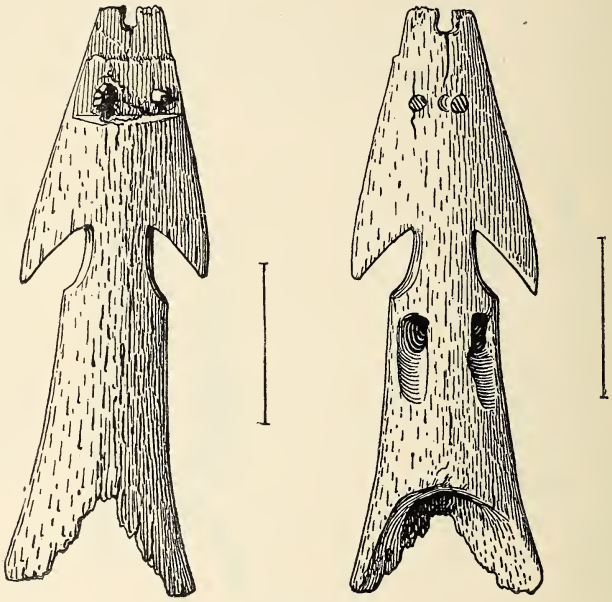


Fig. 35.

OLD BARBED AND TOGGLE HEAD.

West Greenland.

Cat. No. 63940, U.S.N.M.

horizontal as the ends of the barbs are approached. This specimen is noteworthy for conserving the two types of harpoon heads in one, the barbs on the sides, and the toggle.

A combined barbed and toggle harpoon head (No. 63941, U.S.N.M.) of antler from Greenland is represented in fig. 36. It is rhomboid in cross section, sagged downward in the middle, and delicately made. The blade, of iron, formerly present, but now wanting, was held in place by a rivet. The line hole, formed by the meeting of two excavations, is curved, but not visible on the back. Line grooves short and whittled out. Barbs, three—two in front of the line hole and one at the butt. The barbs on the margin in front are sharp and prominent for such a small specimen, the cut of each being three-sided. The rear barb is cocked up and pointed, and its edges ornamented each with

two crenate notches. Butt cut off at a sharp angle, nearly in a single plane; socket wide and shallow. Between the line holes and the socket is an ingenious combination of perforations and gutters for repairing. Length, $3\frac{3}{4}$ inches. Gift of Governor Fenckner, of Greenland.

Of this same type and pattern, but ruder, is Cat. No. 45910, from Greenland, made of bone, and somewhat dilapidated. The hard bone forms the back, and the excavations on the belly are in the spongy portion; the reverse of this is usually true. The slight barbs on the edges are quite squarely sawed out and the single barb at the rear much bent upward. Length, $3\frac{3}{8}$ inches. Gift of the Copenhagen Museum.

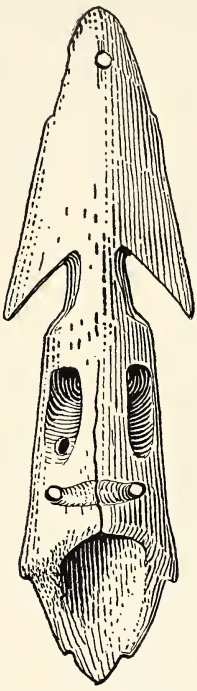


Fig. 36.
BARBED AND TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner. Cat. No. 63941, U.S.N.M.

A combined barbed and toggle head (Cat. No. 63942, U.S.N.M.) from Greenland, made of bone, is shown in fig. 37. Body flat on the belly, and conformed to the shape of the material on the back; an unwise method, because in this case the spongy tissue has to take the strain. Separate blade, none, the material being sharpened to a point and edge. Line holes small, set at an extraordinarily acute angle to each other and barely continued through to the back. Line grooves scarcely visible. Barbs, four—two broad, angular teeth in front, one on either side, and two angular toothed projections behind. Socket shallow and wide. Butt end gouged or dished out, so as to give free play to the loose shaft, and leaving the barbs, looking from the under side, like a pair of fins. Length, 4 inches. Collected by Governor Fenckner. With this example should be compared Nos. 63940 and 45886—the former of whale's rib, the latter of antler. Both these examples are of the same general pattern, but have had iron blades. It should be noted as a local peculiarity that the former has a three-sided notch at the front barbs, the latter only a two-sided notch.

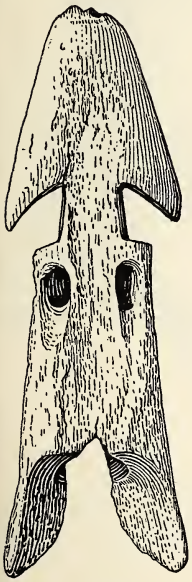


Fig. 37.
BARBED AND TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner. Cat. No. 63942, U.S.N.M.

A toggle head of ivory (Cat. No. 63943, U.S.N.M.) from Greenland,

in shape of a compressed cone, elliptical in section, narrow and sharp at the point, is shown in fig. 38. The blade, of iron, is much rusted and held in by an iron rivet. Line hole straight through the sides in a plane parallel to the blade. Line grooves short and slight. There is one barb terminating the back, but slightly bifurcated. The socket for the foreshaft is wide and shallow and the butt end whittled off with a slight incurve. Length, $3\frac{5}{8}$ inches. Gift of Governor Fenckner. Example 63944 is broken, but similar, the butt-end curve being deeper and the tip not bifurcated (fig. 39). A toggle harpoon head (Cat. No. 63945, U.S.N.M.)

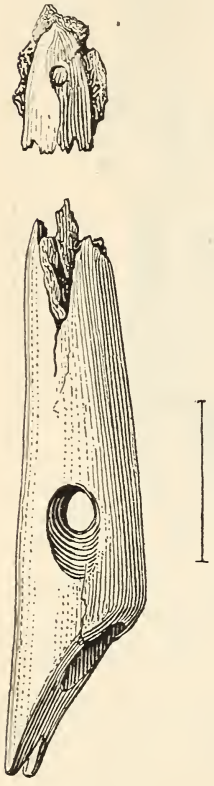


Fig. 38.
TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner. Cat. No. 63943, U.S.N.M.

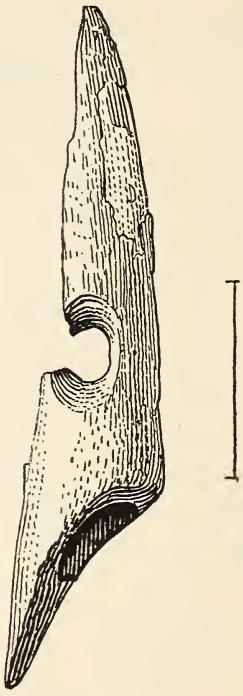


Fig. 39.
OLD TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner. Cat. No. 63944, U.S.N.M.

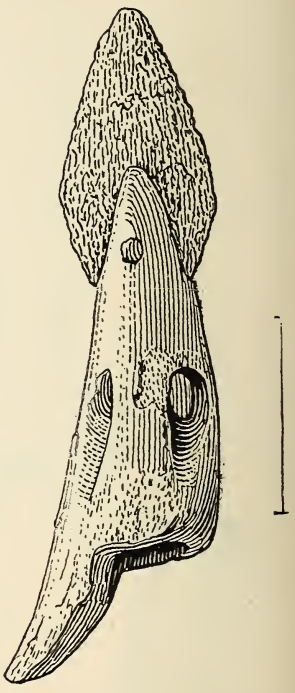


Fig. 40.
OLD TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner. Cat. No. 63945, U.S.N.M.

from Greenland, made of bone and iron, is shown in fig. 40. The body is conoidal, the hastate iron blade being inserted into a saw cut in the pointed end and held by a copper rivet. The line hole lies parallel to the plane of the blade; line grooves slight. The barb is bisected by the plane of the blade, as in many older specimens, but this sets the line hole perpendicular and entirely on the right face of the body. It is possible that the specimen had formerly two barbs. Shaft cavity cut off square below, the spur-like barb extending back-

ward and upward. Length, 3½ inches; width or thickness through line hole, seven-eighths inch; depth, five-eighths inch. Gift of Governer Fenckner. Similar to this specimen is Cat. No. 63949 (fig. 41), of bone, in form of a flat hexagonal prism, the point abruptly cut off. Line holes cut upward through the two lower faces. In this example the spur is on the left-hand side, if the line hole be taken as underneath. It is a little difficult to understand how such an implement would toggle and hold. Length of 63949, 2½ inches. Greenland. Gift of Governor Fenckner.

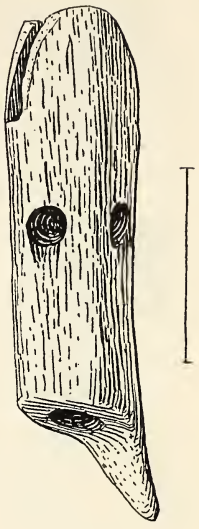


Fig. 41.
TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner.
Cat. No. 63949, U.S.N.M.

An old toggle harpoon head (Cat. No. 63946, U.S.N.M.), from west Greenland, made of bone all in one piece, in section a rounded triangle, is shown in fig. 42. The blade is formed by whittling the material to a pyramidal point with four faces. The line hole is bored straight through in the plane of the blade, enlarged and the rear edges whittled down for line grooves. Barbs, two, in fish-tail pattern on the back. Socket, three-fourths inch deep; butt, whittled out with slight incurve; length, 2⅞ inches. Gift of Governor Fenckner. Example 63947 (fig. 43), from the same locality, is a modern specimen of bone, on the same order, but an iron blade was inserted at the point. The line-hole cavities pierce the back, the grooves are deeper, and the butt end is scooped out. Length of 63947 is 2¾ inches; from Greenland. Gift of Governor Fenckner.

Fig. 42.
SMALL TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner.
Cat. No. 63946, U.S.N.M.

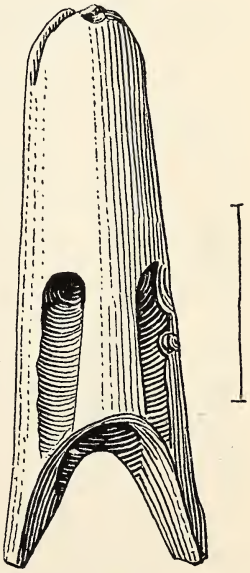


Fig. 43.
OLD TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner. Cat No. 63947, U.S.N.M.

A toggle head from western Greenland (Cat. No. 63948, U.S.N.M.), in shape of a long rectangular pyramid with rectangular cones, is shown in fig. 44. Point formed by whittling down the sides. The blade slit lies in the plane of the long diagonal of the body. Line hole

run in perpendicular to the two lower sides or faces, having slight line grooves. Barbs two, one on the right margin, one on the left, their tips lying in the bisecting plane of the toggle head. Socket extending into the line hole. Butt end whittled away equally above and below. Length, $2\frac{3}{4}$ inches. Gift of Governor Fenckner. Cat. No. 63950 is of the same type, $2\frac{1}{4}$ inches long.

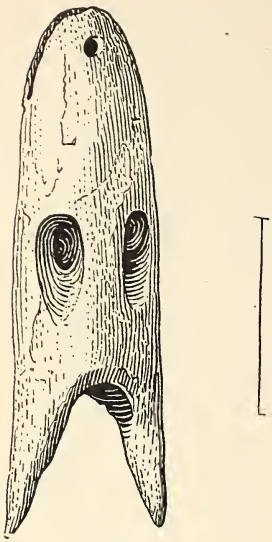


Fig. 44.
OLD TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner. Cat. No. 63948, U.S.N.M.

A grave relic (Cat. No. 63950, U.S.N.M.) representing a small toggle head of a harpoon from Greenland, the gift of Governor Fenckner, is shown in fig. 45.

The body, rhomboidal in section, the back and front being about alike, is made of a segment from the columnar portion of a bone. The fact that both sides are equally hard necessitates the forming of the shaft socket in the hollow part of the bone. The barbs are cut out of the two angles or wings on the two sides of the body. The line hole is interesting, being effected by cutting two holes perpendicularly into the two faces of the belly, meeting in the hollow part of the bone. Each of these is flanked with a shallow gutter in which lies the line. The forming of a toggle head out of the middle column of a bone instead of a piece of ivory, antler, or solid bone is rare. Length, 2 inches.

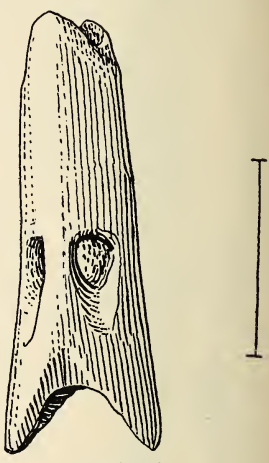


Fig. 45.
SMALL TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner. Cat. No. 63950, U.S.N.M.

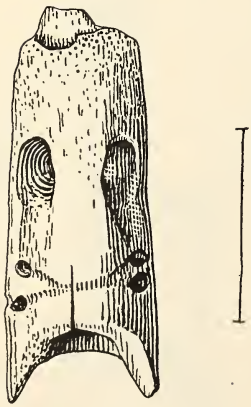


Fig. 46.
OLD TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner. Cat. No. 63951, U.S.N.M.

An old toggle head (Cat. No. 63951, U.S.N.M.) from west Greenland is shown in fig. 46. The point has been broken off, but enough is left to show a small portion of the blade slit. It belongs to the type of specimen 45855, and the socket in the base for the foreshaft is flanked by two equal barbs. A common type in harpoon heads from this area. The line hole on the end side is formed by the meeting of

two conical bores, afterwards smoothed down so as not to injure the line. This method of forming the hole by the meeting of two separate cones is well known to students of archæology. Four small perforations are seen between the line hole and the socket, drilled for the purpose of stopping the further opening of a crack in the base.

Fig. 47.
SMALL TOGGLE HEAD.
West Greenland.
Gift of Governor Fenckner
Cat. No. 63952, U.S.N.M.

A small toggle head of bone (Cat. No. 63952, U.S.N.M.), blackened by age, from west Greenland is shown in fig. 47. It is square in cross section, one angle extending from tip of the point to tip of the barb and having a pyramidal point. There is no blade. Line holes bored straight in from the two lower surfaces, line grooves short and deep. Barb one, socket half an inch deep, butt end beveled off diagonally from lower edge to upper edge. Length, 2¼ inches. Collected by Governor Fenckner.

Cat. No. 63963 in the U. S. National Museum is a harpoon of bone from southwestern Greenland. It consists of two parts, the shank and the hinged toggle. The shank is pierced at one end to act as a hinge and at the other end in two places for the attachment of a shaft. The toggle is spindle shaped, hollowed on one side, and pierced with three holes to facilitate the hinging. This specimen is evidently an imitation or adaptation in bone of the iron fluke in the harpoons of the whalers. Length of shank, 4½ inches. Gift of Governor Fenckner.

Fig. 48.
SHAFT OF SMALLER HARPOON.
South Greenland.
Collected by Chief Signal Officer, U. S. A.
Cat. No. 72566, U.S.N.M.

The smaller harpoon shaft (Cat. No. 72566, U.S.N.M.), from southern Greenland, is illustrated in figs. 48 and 49. This figure is introduced for the purpose of showing the details of the shaft, which are quite local. The loose shaft is made of bone or ivory, square at the base and socketed to fit over a small projection on the foreshaft. Two holes are bored through the former, and through these and two in the end of the shaft a stout rawhide thong passes and is tightly drawn to form an elastic spring, useful in the shipping and unshipping of the loose shaft. What answers to the foreshaft

in this specimen is simply a cap of ivory with a little projection on the top. The hinging line is not attached to it in any way. The ivory pegs driven into the shaft near its lower end are for the throwing stick, which is peculiar to this region, and for the eyelets used in tightening the line when the toggle is in place and ready for action.

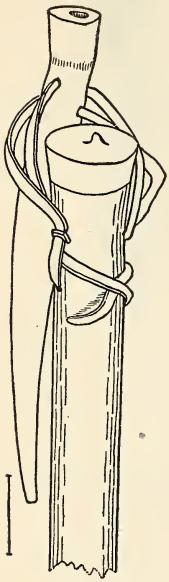


Fig. 49.
FORESHAFT AND LOOSE SHAFT OF FIGURE 48,

Especial attention is drawn to the lower end of the shaft, on which are pegged or riveted two plates of ivory, which not only resemble feathers on an arrow, but must perform a similar function. The foreshaft is so light that it could be of little use in giving directness to the flight of the weapon, but the feathers of ivory fastened on at the end would remedy this defect and steady the shaft in the air. It is thought by some that the existence of these plates of ivory on the base of the shaft is an indication of the descent of the harpoon from the arrow.

A kaiak lance (Cat. No. 74126, U.S.N.M.) from Holstenberg, Greenland, was collected by Capt. J. W. Collins. The shaft is of pine wood, elliptical in section, tapering in both directions from the hand rest and at the front, and swells out to fit neatly the foreshaft or cap of bone. Upon the narrow side of the shaft in front of the middle portion are the finger rests, which consist of a peg of wood driven into a hole on one side and on the other a flat portion of bone set in a quadrangular mortise, and having at the outer end on one side a groove for the finger.

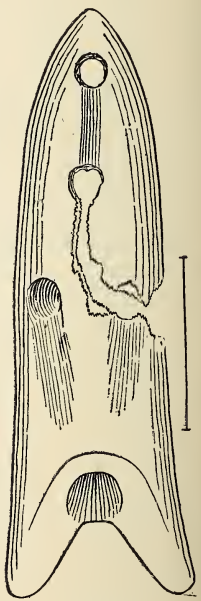


Fig. 50.
OLD TOGGLE HEAD.
Upernavik, Greenland.
Collected by Theodore Holm.
Cat. No. 130371, U.S.N.M.

The piece of bone corresponding to the foreshaft is not more than half an inch in length, perfectly flat across the outer end, and at its middle portion is a slight projection or pivot. The loose shaft is of narwhal tusk, flattened in cross section and mortised into a piece of bone in form of a truncated cone. Its widest portion, with a slight socket in the middle, sits flat upon the cap or foreshaft. This particular combination is of a more advanced type than the ordinary ball-and-socket joint with the Cumberland Sound Eskimo, growing out of the fact that these Greenland Eskimo have been for many centuries in contact with the Scandinavians. In this case the two flattened surfaces cause the lashing to act as a spring holding the foreshaft or blade piece straight in front

of the shaft. These two parts are united by means of a bit of rawhide passing through two holes in the foreshaft and three holes in the loose shaft a foot from the end. The lashing is similar to that of the Cumberland Sound types, with slight local differences of administration. In front of the blade piece is the blade of iron, lanceolate in form, with truncated base set in a saw cut at the tip and held fast by a copper rivet. This lance is for stabbing the walrus or whale at close quarters from the kaiak. Length of shaft, 62 inches; loose shaft, 8½ inches; blade, 3½ inches.

An old toggle harpoon head (Cat. No. 130371, U.S.N.M.) from Upernavik, Greenland, is shown in fig. 50. It has an iron blade riveted on to the front of the body, parallel to its broadest diameter. The line holes were bored in from two directions, and apparently perforated the body after the manner of the toggle head used on the Amur River and figured in Schrenck. Length of body, 3⅜ inches. Gift of Theodore Holm.

A harpoon for killing whales (Cat. No. 90103), used by the Little Whale River Indians on the coast of Labrador, is shown in fig. 51. The shaft is of wood, the foreshaft of bone. The base of it is wedge-shaped, and fits into the slit at the end of the shaft, being held in place by a lashing of sinew cord. On the end of the foreshaft fits the toggle head, with iron blade held fast by two rivets. The body of the toggle head is rectangular in cross section. The line hole passes through the sides and is not seen on the lower part. The wide barbed end is cut into three or four tooth-shaped parts. The line is of rawhide, plaited. The peculiarity of this harpoon is a board, somewhat circular in form, on the lower end of the shaft, which acts as a drag to the wounded animal, in place of a seal-skin float. The line passes between this board and the shaft, and has a handle or toggle fastened at the other end to be held in the hand of the fisherman.[1]

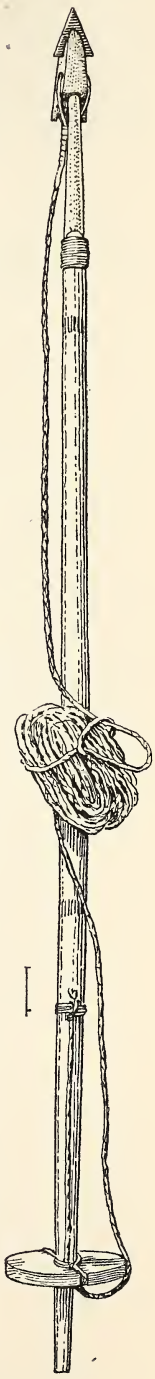


Fig. 51. MODEL OF HARPOON. Whale River, Canada. Collected by Lucien Turner, after Murdoch. Cat. No. 90103, U.S.N.M.

If Hearne be correct, the Eskimo west of

[1] Lucien Turner, Hudson Bay Eskimo, 1894, p. 314, figs. 138, 139.

Hudson Bay have no other method of catching fish, unless it be by spears and darts; for no appearance of nets was discovered either at their tents or on any part of the shore. This is the case with all the Eskimo on the west side of Hudson Bay; spearing in summer and angling in winter are the only methods they have yet devised to catch fish, though at times their whole dependence for support is on that article.[1]

### HARPOONS OF THE CENTRAL ESKIMO.

Coming to the central Eskimo, Boas says of them that they inhabit the northeastern part of the continent and the eastern islands of the Arctic-American archipelago. In Smith Sound they inhabit the most northern countries visited by man, and their remains are often found at its northern outlet. The southern and western boundaries are the countries about Fort Churchill, the middle part of Back River, and the coast west of Adelaide Peninsula.[2] In this monograph will be found an excellent bibliography of that area, which has been famous in historic times for the efforts made there to find the northwest passage between the two great oceans.

The harpoon or principal lance (unahk, Kane) of the Eskimo is attached to the sealing line. The rod or staff is divided at right angles in two pieces, which are neatly jointed or hinged with tendon strips, but so braced by the manner in which the tendon is made to cross and bind in the lashing that, except when the two parts are severed by lateral pressure, they form but a single shaft. The point, generally an arrow-head of bone, has a socket to receive the end of the shaft; it disengages itself readily from its place, but still remains fast to the line. Thus when the kaiaker has struck his prey, the shaft escapes the risk of breaking from a pull against the grain by bending at the joint, and the point is carried free by the animal as he dives. At the right center of gravity of the harpoon, that point at which a cudgel player would grasp his staff, a neatly arranged cestus or holder (noon-sok) fits itself on the shaft. It serves to give the kaiaker a good grip when casting his weapon, but slides off from it and is left in the hand at the moment of drawing back his arm.[3]

In the weapons used for killing their game there is considerable variety, according to the animal they are pursuing. The most simple of these weapons is the "oonak" (Parry), which they use only for killing the small seal. It consists of a light staff of wood 4 feet in length, having at one end the point of a narwhal's horn, from 8 to 10 inches long, firmly secured by rivets and wooldings; at the other end is a smaller and less effective point of the same kind. To prevent losing the ivory part, in case of the wood breaking, a stout thong

[1] Hearne, Journey, etc., London, 1795, p. 159.

[2] Franz Boas, The Central Eskimo, 1888, p. 414.

[3] E. K. Kane, The Grinnell Expedition, New York, 1854, pp. 478 and 479.

runs along the whole length of the wood, each end passing through a hole in the ivory, and the bight secured in several places to the staff.

A considerable degree of ingenuity is displayed in an appendage called "siatko," consisting of a piece of bone 3 inches long, having a point of iron at one end and at the other a small hole or socket to receive the point of the oonak. Through the middle of this instrument is secured the allek, or line of thong, of which every man has, when sealing, a couple of coils, each from 4 to 6 fathoms long, hanging at his back. These are made of the skin of the oguke, as in Greenland, and are admirably adapted to the purpose, both on account of strength and the property which they possess of preserving their pliability even in the most intense frost.[1]

Formerly the harpoon (unang, Boas) consisted of a shaft having at one end an ivory point firmly attached by thongs and rivets, the point tapering toward the end. The point was slanting on one side, so as to form almost an oblique cone. Thus it facilitated the separation of the harpoon head from the unang. On the opposite end of the shaft another piece of ivory was attached, generally forming a knob. The material used in making the shaft was wood, bone, or ivory, according to the region in which it was manufactured. In Iglulik and in Aggo the narwhal's horn was the favorite material for the whole implement, a single horn being sufficient to make a whole shaft. Wherever wood could be procured small pieces were ingeniously lashed together. As the shaft is apt to be broken by the struggles of the animal when struck by the weapon, it was strengthened by a stout thong running along the whole length of the shaft.[2]

A strange method of hunting is reported by Ross[2] as practiced by the Netchillirmiut. Eight men slowly approached the basking seal until it raised its head, when those in front stopped and shouted as loud as they could, on which three others ran up with incredible swiftness, and the leader struck it with the spear.[3]

Boas says that when the smaller bays are sufficiently frozen to permit, the hunters will visit the edge of the newly formed floe in order to shoot the seals, which are afterwards secured by the retrieving harpoon.[4]

A fine old toggle head (Cat. No. 8278) from Smith Sound, was collected by Dr. I. I. Hayes. The body is of ivory, thin, spatulate in form, and lenticular in cross section. The blade of iron is almost concealed in a deep saw cut and fastened with an iron rivet. The line hole has been bored out with a drill that was too small and enlarged by cutting. One side of the body having split off, and the other side cracked, the

[1] Parry, Second Voyage, London, 1824, p. 507.

[2] Narrative, etc., London, 1835, II, p. 451.

[3] Sixth Annual Report of the Bureau of Ethnology, p. 485.

[4] Compare Murdoch's account of the retrieving harpoon, Sixth Annual Report of the Bureau of Ethnology, p. 420.

Eskimo has ingeniously drilled a series of holes along the margins and repaired the socket by means of sealskin thongs rolled backward and forward. The line in this case is a coarse thong of walrus hide, which is looped through the line hole and fastened by a wrapping with a smaller thong, in which the Eskimo has exhausted his ingenuity by a variety of knots and splices.

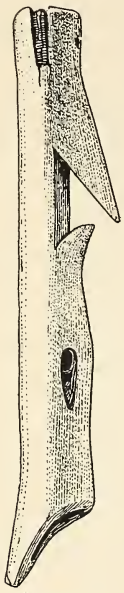


Fig. 52.
OLD BARBED AND TOGGLE HEAD.
Upernavik, Greenland.
Collected by I. I. Hayes. Cat. No. 8279, U.S.N.M.

A combined barbed and toggle harpoon head of bone (Cat. No. 8279 U.S.N.M.) from Upernavik, Greenland, is shown in fig. 52. Body long, irregular cylinder, whose diameter varies in proportion to the strain at each point, cut off quite abruptly at the point. The economy of material is noteworthy. Blade cut shallow; iron blade broken off, but its lower margin remains in the cut, held in place by means of an iron rivet. Line hole small, curved up and strengthened on the outside by an additional thickness of the body. Line grooves slight. Barbs, two, the front one a very prominent hook, triangular underneath, its rear margin also a shallow hook with rounded edge. In this respect the specimen is unique in the U. S. National Museum. The rear barb is cocked up and pointed. In the tip of this barb is a hole half an inch deep, and three small perforations for rivets are to be seen above it. The precise use of these perforations is not known. Socket an inch deep, the butt end whittled off with a slight incurve. Length, 6 inches; diameter, three-fourths inch. Collected by Dr. I. I. Hayes.

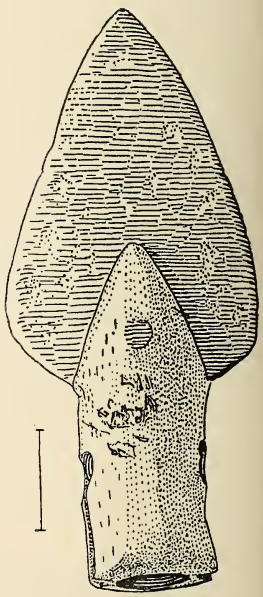
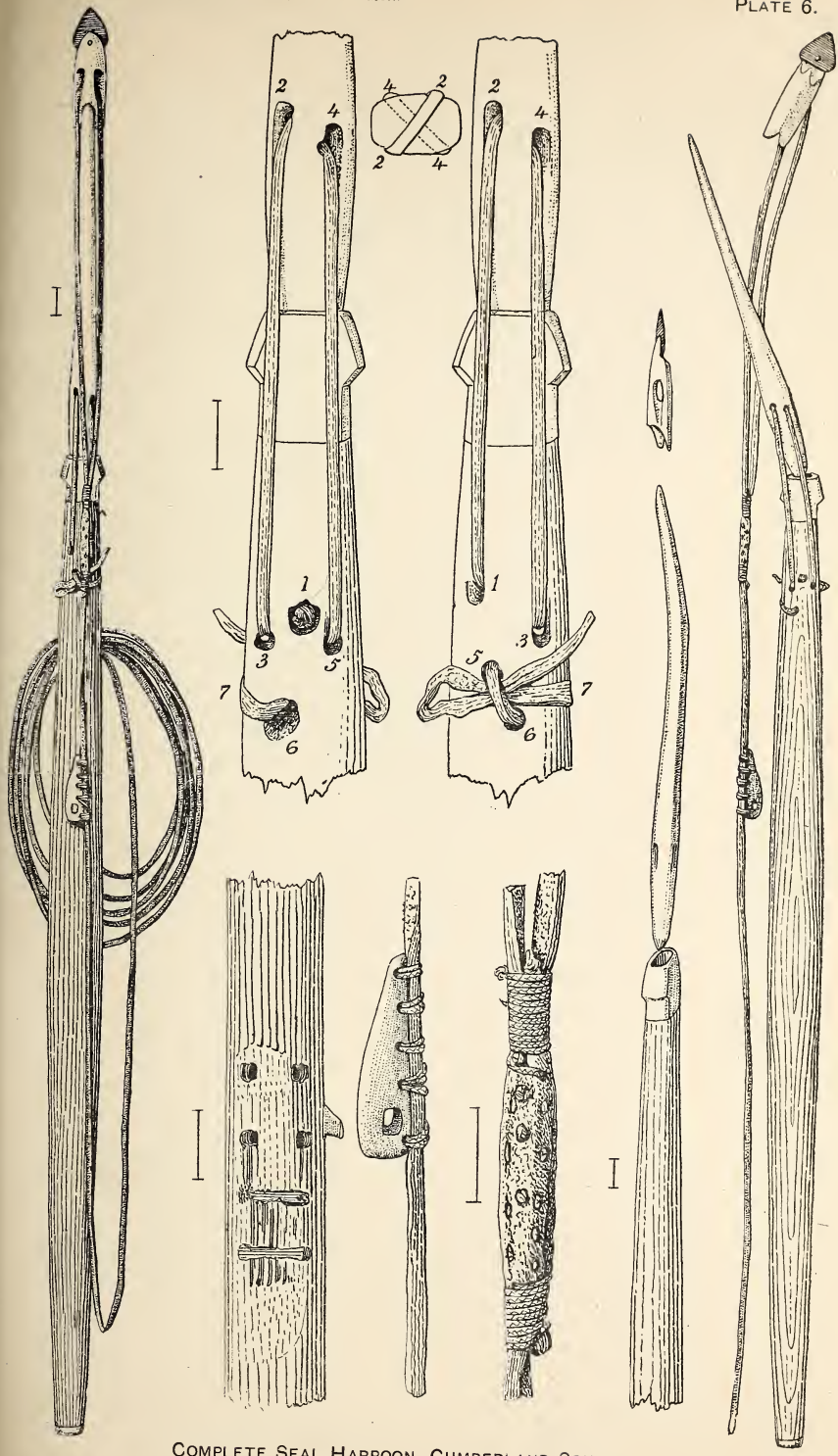


Fig. 53.
LOOSE HEAD OF A LANCE.
Repulse Bay.
Collected by C. F. Hall. Cat. No. 10136, U.S.N.M.

A loose head of a lance (Cat. No. 10136, U.S.N.M.) is given in fig. 53. A careful inspection of this specimen, and others like it, will show that it lacks the essential qualities of a harpoon, namely, of being hinged to the end of the shaft and of retrieving. There is neither barb nor toggle on this specimen or others of the same class. The hinged lance, either in the form of a weapon to be thrust or of one to be thrown from hand or bow or throwing stick, is exceedingly rare. Only in the areas where immense sea mammals are hunted is it thought necessary to guard in this way




COMPLETE SEAL HARPOON, CUMBERLAND SOUND.
Collected by George Y. Nickerson.
Cat. No. 19519, U.S.N.M.

against breaking the shaft. Indeed, it will be found that the Eskimo on the other side of the continent do not hinge the lance head, but merely socket it and leave it in the animal stabbed. Collected by Captain C. F. Hall.

An old, much weather-beaten toggle head of bone (Cat. No. 10404, U.S.N.M.), without blade, from Repulse Bay, is shown in fig. 54. The body is perfectly flat on the back and uniformly ridged below, so that in section the form is that of a hat with narrow rim. The blade slit in the truncated tip shallow and wide and there is no show of rivets. Linehole, large and straight through, with wide grooves before and behind it. There were evidently two barbs, but after some mending one has disappeared. The butt was beveled nearly in a plane surface. Sockets half an inch deep. Length, 3¾ inches. Collected by Captain C. F. Hall.

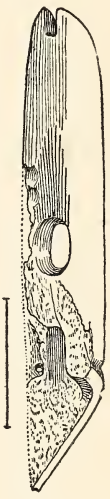


Fig. 54.
TOGGLE HEAD.
Repulse Bay.
Collected by C. F. Hall.
Cat. No. 10404, U.S.N.M.

Example 19519, in the U. S. National Museum, Plate 6, is a complete toggle harpoon for seals, from Cumberland Sound region, collected by George Y. Nickerson. The shaft (qijuqtenga) is of hard pine wood, quadrangular in section, with rounded corners, thick in the middle, and tapering toward either end. The foreshaft (qatirn) or socket piece, about 2 inches long, is of walrus ivory, mortised neatly upon a tenon at the end of the shaft. In longitudinal section it is in the shape of a tanged lance blade, with the point truncated. The upper and outer end of the qatirn has a rounded socket for the reception of the loose shaft, to be described. At the lower end of the shaft is an ivory cap, set on and held in place by two wooden dowels. Upon the narrow margin of the shaft, absent in this specimen, is set a hand rest (tikagung), as a stop for the hand of the hunter when making his thrust. At right angles to the tikagung is a peg or button of ivory, which fits into the telliqbing or eyelet piece of ivory on the line. The loose shaft is a stout piece of ivory, spindle shaped, with a long taper in front and a very short tapering butt end. This fits like a ball at the socket joint into the socket.

At the end of the qatirn or foreshaft two holes are bored through the loose shaft 3 inches from the socket joint. Corresponding holes are bored through the shaft 4 inches from the front end. An inch farther back from these two holes two other holes are bored near together.

Looking at this apparatus from one side, a seal-skin thong passes from the back forward through the upper left-hand hole in the shaft, up through the left-hand hole in the loose shaft, back and through the upper right-hand hole in the shaft, and up and through the right-hand

hole in the loose shaft, and down to the lower right-hand hole in the shaft, through and back through the lower left-hand hole in the shaft, half way round the shaft, and gathered in a loose knot through the lower bend of the thong on the front side of the shaft. This ingenious joint deserves especial attention. It is put in place while wet or green, and by its shrinking forms a close hinge for holding the loose shaft in the socket of the foreshaft. When a large animal is struck and the loose shaft rammed into its body, the violent motion, instead of breaking the brittle ivory, unbends the ball and socket joint, the thong serving as a hinge.

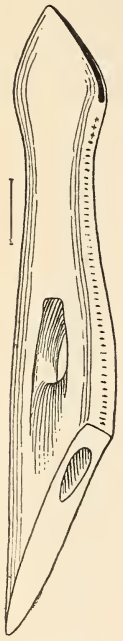


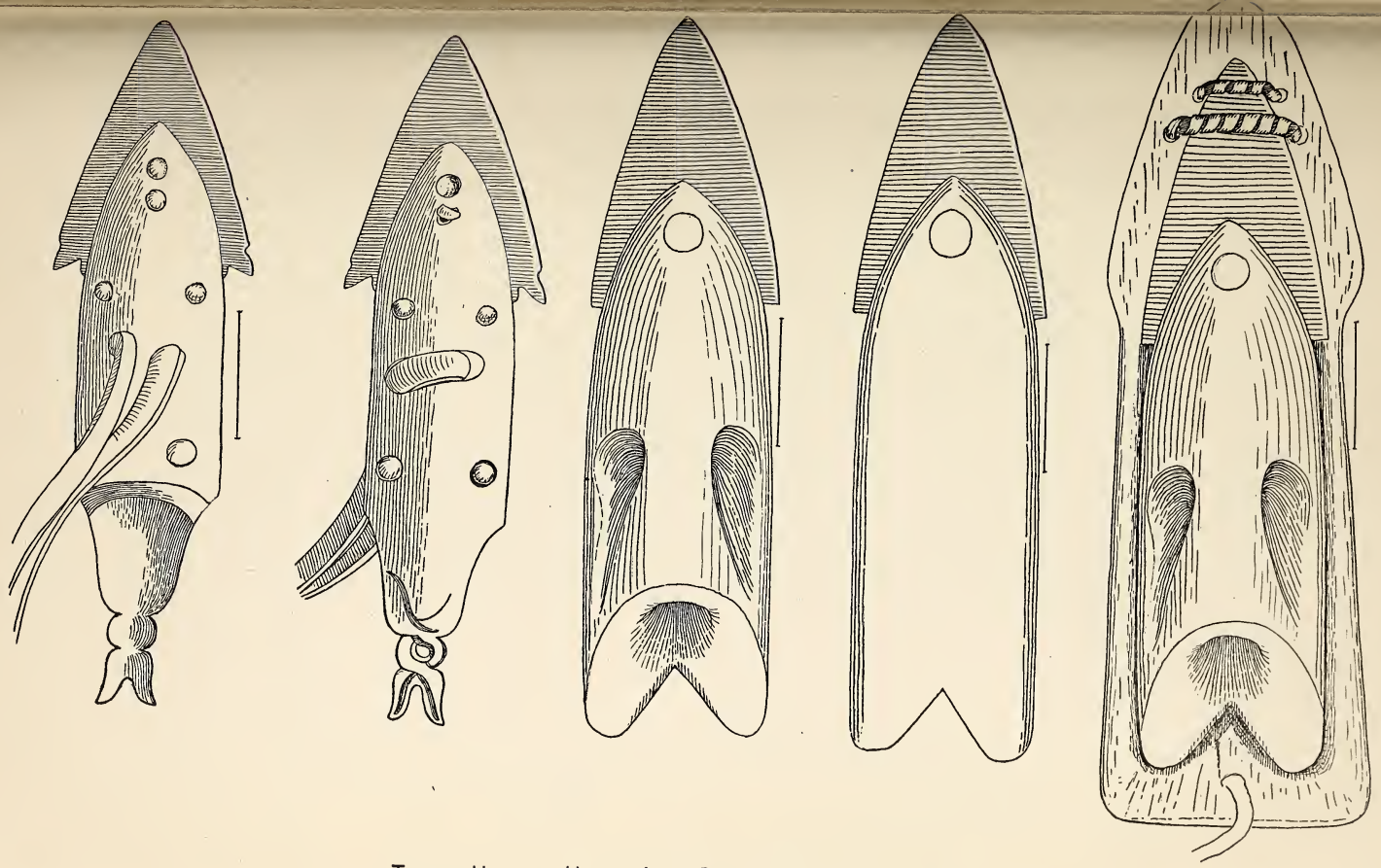
Fig. 55.
HEAD OF WHALE HARPOON.
Hudson Bay.
Collected by J. H. Bartlett. Cat. No. 25654, U.S.N.M.

The toggle head (tokang) is of walrus ivory, flat on one side and obtusely angular on the other. On this same side are two large angular cuts, forming a perforation entirely through but not piercing the back. Barbs, two.

The line (alirn) is of stout rawhide bent through the hole in the toggle head, and the end is joined to the standing part by being sewed together, and also seized or wrapped at either end of this sewing. On the alirn, at a point exactly corresponding to the hand rest, is sewed or run the teliqbing, which is a somewhat flat piece of ivory, having five holes for the stitching or braid of sinew and a quadrangular hole cut in the broad part to fit over the ivory peg on the side of the shaft, which draws the line perfectly tight and holds the toggle head on the tip end of the loose shaft. The line may be continued to any length, where it terminates in a loop, and one or more bladders (avatang) may be attached to it. Length of shaft, 41 inches; loose shaft, 16 inches; tokang, 5 inches.

The head (Cat. No. 25654, U.S.N.M.) of a whale harpoon from Hudson Bay is shown in fig. 55. It is made of walrus ivory, and probably by machinery. The U. S. National Museum possesses a large number of harpoon heads of this type. The angle on the back is sharp and the front is hexagonal. The specimen conforms to a model or type as if made in large numbers for trade with the Eskimo.

The blade is of iron and neatly fitted into a socket in the bluntly pointed tip end of the body. At the upper inner corner of the blade is a perforation for the reception of a small line of sinew, which serves to retain the blade if it becomes detached from its slit. The socket is a shallow conical cavity, made to fit on the outer end of the loose shaft. The butt end is a long bevel, slightly incurved. The line hole is made with great care, being a large triangular opening with ample grooves on either side for the play of the line. The material is



TOGGLE HARPOON HEADS, AMUR RIVER AND CUMBERLAND SOUND.

Amur example, after Von Schrenk; Cumberland Gulf example, Cat. No. 34064, U.S.N.M.

Collected by Ludwig Kumlein.

cut away economically at every point, so as to protect the line from abrasion. There is no separate becket, but the end of the line is spliced into itself to form a loop.

No. 25554 is similar to the foregoing in most respects. The outline is a little more artistic, but the general form and functioning of the parts are precisely the same. Length of blade, 2½ inches; length of body, 6 inches.

Plate 7 is a typical broad toggle harpoon head (Cat. No. 34064, U.S.N.M.) from Cumberland Sound. The ivory body is lingulate in outline, nearly flat on the back, and rounded beneath for line hole and socket. Blade triangular, oblong, set 1 inch into the saw cut, and held in place by a large copper rivet. No blade hole is present. Line hole well back, large, bent up a little, and running into very deep line grooves. Socket wide and shallow. Barbs, two, formed by the bifurcation of the back. Butt end curved in and somewhat gouged out. Length, 5¾ inches. Collected by Ludwig Kumlein. The head fits back downward into a cover carved of a piece of pine wood. The point lies under two loops of baleen passed through the wood and frapped. A rawhide thong fastened into the butt serves to wrap the toggle and cover together. Other specimens in the Museum, collected in the same locality by Mr. Kumlein, have precisely the same characteristics. The specimens are more slender. It will be noted that the blade, the barbs, or spurs at the base, and the bottom or inside of the line hole are in parallel planes. This is to be regarded as the old or primitive style. In the more modern heads, as will be seen, the line hole is perpendicular to the plane of the blade. Front and side views of a large toggle head from the Amur are given to show how the old type survives in out-of-the-way places far apart, while the new type holds the intermediate localities. (Schrenck, Plate 42.)

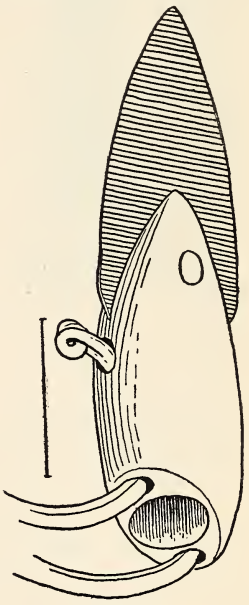


Fig. 56.
HEAD OF WHALÆ LANCE.
Cumberland Sound.
Collected by L. Kumlein. Cat. No. 34067, U.S.N.M.

The head of a whale lance (Cat. No. 34067, U.S.N.M.) from Cumberland Gulf, collected by Ludwig Kumlein, is shown in fig. 56. The body is of ivory, in the form of a flattened conoid. The blade of iron is leaf-shaped, set into a saw cut at the point in the plane of the widest diameter of the head, and held in place by a brass rivet. The shaft socket is a deep cone. On either side of the head a line hole is made by two borings, one vertical and the other horizontal and larger. Into each a line or thong of seal hide is drawn, with a knot on the upper

end which fits into the horizontal bore and forms a button or stop. These two thongs unite about a foot below the head to form one continuous line. Length of head, $3\frac{3}{8}$ inches.

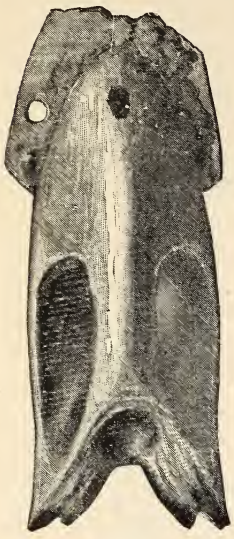


Fig. 57.

TOGGLE HEAD, TAKEN FROM DEAD WHALE.

Cumberland Sound.

Collected by Ludwig Kumlein, after Franz Boas. Cat. No. 34069. U.S.N.M.

A broad, flat harpoon head (Cat. No. 34069, U.S.N.M.) of walrus ivory (tokang), taken from a large *Balæna mysticetus* caught in Cumberland Sound in 1878, is shown in fig. 57. This specimen was collected by Ludwig Kumlein. The body is lingulate in form, with a sharper curve below. The iron blade, broken off at the point, is deep, set into a saw cut, and riveted with iron. Near the left-hand corner is bored a blade hole for a securing line. The line hole is large, curved upward, and the grooves are deep for the thick rawhide line, but they do not perforate the head and they are not seen on the back of the toggle head. The butt end is gouged out in a spoon-shaped cavity and is bifurcated to form two barbs, and these are split at their hinder extremity. The tips of the barbs have ornamental notches. The socket below the plane of the barbs is wide and shallow. Mr. Kumlein believes that this head was thrust into the whale while it was a yearling, as the Eskimo do not attack a large one with their own weapons. Length, 4 inches.[1]

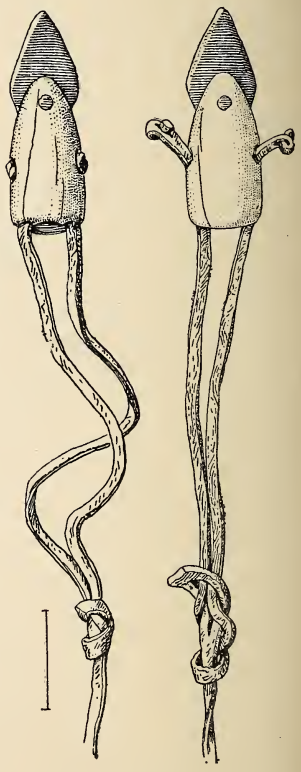


Fig. 58.

LOOSE HEAD OF LANCE.

Cumberland Sound.

Collected by Ludwig Kumlein. Cat. No. 34068, U.S.N.M.

A loose head of a seal lance (Cat. No. 34068, U.S.N.M.) is shown in fig. 58. Body is of ivory, blade pentagonal in shape, and fastened in with a rivet. The body is conoid in form, with a square base. The socket for the end of the foreshaft is conical, and alongside of this at the margin two holes are bored, opposite each other, perpendicular for a notch, at which point they are met by two other

[1]Sixth Annual Report of the Bureau of Ethnology, p. 490, fig. 422.

holes bored in horizontally. Into these holes fit two rawhide thongs, by means of which the loose heads are attached firmly to the end of the shaft. The noticeable feature about this specimen is the thoroughly aboriginal style of boring the holes and of attaching the thongs. The slit is cut near the end of the thong, and through this the outer end passes, being bent backward. This forms a button which fits exactly into the horizontal hole on the side of the head. At the other end of the thongs in the drawing are shown methods of splicing practiced by the central Eskimo. There is nothing which exhibits their ingenuity more effectively than the way in which the difficulties are overcome by simple processes.

A lance head (Cat. No. 34076, U.S.N.M.) from Cumberland Sound is shown in fig. 60. It can not be called either a toggle head or a barb, since it possesses neither characteristic. It is simply a pivoted lance head. Body, flat. Blade, of iron, irregularly rhomboidal, made to fit into the saw cut by a nail head driven under the edge, held in place by an iron rivet.

Fig. 60.
LOOSE HEAD OF LANCE.
Cumberland Sound.
Collected by Ludwig Kumlein. Cat. No. 34076, U.S.N.M.

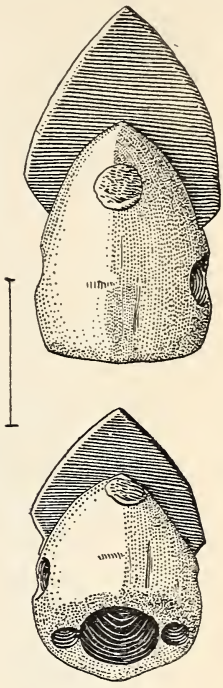


Fig. 59.
LOOSE HEAD OF LANCE.
Cumberland Sound.
Collected by Ludwig Kumlein Cat. No. 34077, U.S.N.M.

There is no line hole in the harpoon acceptation, but on either side of the socket a hole is bored forward in the plane of the blade and met by a larger one bored inward half an inch from the butt end. Into each hole a rawhide line is made fast by means of a knot peculiar to the Eskimo, effected by cutting a slit a short distance from the end of the line and tucking the end backward through the slit. This knot will enter the larger hole on the side, but will not pull through the smaller longitudinal one. The socket is conical, wide, and fully an inch deep. Length, 2 inches. Collected in Cumberland Sound by Ludwig Kumlein. Similar to this are 34068 and 34077 (fig. 59), and Boas figures another specimen after Kumlein's drawings.

Cat. No. 73529 in the U. S. National Museum is a whale lance (anguvigang), from Cumberland Sound. The shaft (qijuqtenga) is of hard pine wood, possibly from a ship. Cross section elliptical and flattened. It is tapering in the middle in both directions. The fore-

shaft (qatirn) is a short head of bone mortised upon the end of the shaft, truncated arrow shaped, in longitudinal cross section. On the narrow side of the shaft, about one-third of the distance from the foreshaft, is a hand rest (tikagung) made of a quadrangular bit of bone. This is perforated from side to side, laid against the shaft and lashed with a

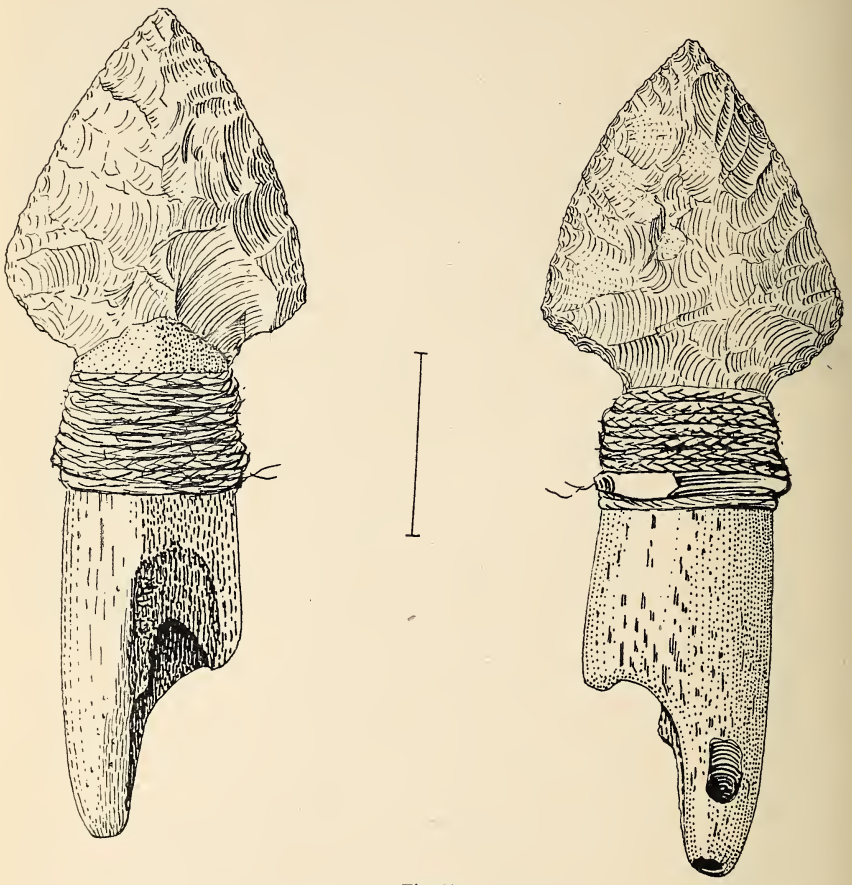


Fig. 61.

OLD TOGGLE HEAD WITH STONE BLADE.

Cumberland Sound.

Collected by Geo. Y. Nickerson. Cat. No. 19521, U.S.N.M.

strip of baleen. At right angles to this on the broad side of the shaft is a peg protruding, resembling the peg for the line, but it is evidently an added part, as it has no function.

The loose shaft of ivory has a blunt pivot on the inner end which fits into a socket in the foreshaft to form the ball-and-socket joint (lgaming). The head is irregular, hexagonal in cross section and in a saw cut in the front end a leaf-shaped blade of iron is inserted and riveted. The loose shaft and the foreshaft are hinged together, as in other speci-

mens, by a thong of rawhide. This ingenious joint is most effective as a universal hinge. It can be easily unloosed and made tighter. By a universal hinge it is meant that in every direction the loose shaft is sustained in a line with the shaft by the rigidity of the rawhide, which is not so strong, however, but that when an extraordinary strain is placed upon the loose shaft the rawhide will give way in any direction and allow the pivot to come out of the socket and save the apparatus from breakage. No long line is used with this form of apparatus. A similar specimen is figured from the Berlin Ethnological Museum, by Dr. Franz Boas.[1] Length of shaft, 43 inches; loose shaft, 16 inches.

The harpoon of the Cumberland area, as shown by the previous descriptions and illustrations, is far more primitive and less affected by contact with Europe than that of Greenland or Hudson Bay type. In closing a study of this region attention is called to fig. 61, Catalogue No. 19521 in the U. S. National Museum. It can not certainly be defined as a barbed head, nor as a toggle head. It has the form of the toggle head, but the line hole, instead of passing through the body above the socket, is a perforation in the end of the spur. A hole has been bored through this end in a line parallel to the axis of the body and is met by another perforation on the side of the spur. The connecting line evidently passed up through this opening and was toggled by means of an Eskimo knot formed by cutting a slot near the end of the thong and turning the end back through the slit. The socket does not differ from that of other harpoons. The head, however, is a large and lanceolate blade of chipped stone, reminding one of the whale lance blades brought home by Ray from Point Barrow and described by Murdoch. The tang of this blade fits upon an offset at the end of the body and is held in place by a knot, also of sinew braid. The perforation in the spur for the connecting line is almost unique in the collections of the U. S. National Museum. One other specimen has a perforation at this point, fig. 52, Catalogue No. 8279. In this specimen, however, the perforation seems to have no function, since through the body of the toggle head there is a regular line hole with line grooves.

### HARPOONS OF ARCTIC ALASKA.

The situation, the climate, the people, and the natural resources of this area are minutely set forth by Murdoch. The harpoon, as will be seen, is related to all these. In his treatise on Point Barrow Eskimo the last-named writer describes and figures both seal darts and toggle harpoons, and these are included in our subject. He says that the Eskimo use, to capture the smaller marine animals, a dart or small harpoon having a loose barbed head of bone fitted into a socket at the end of the shaft, to which it is attached by a line of greater or less

[1] Sixth Annual Report of the Bureau of Ethnology, p. 496, fig. 432.

length. It is always contrived so that when the head is struck into the animal the shaft is detached and acts as a drag. At Point Barrow only the small form of dart is used. In ancient times a larger weapon, with bladder on the side of the shaft, was employed. All kinds of marine animals are also pursued with toggle harpoons of the same general type, but of different patterns for different animals. They are divided into two classes, those intended for throwing and those which are thrust with the hand. Both classes agree in having only the head attached permanently to the line fitted loosely to the end of the shaft, and arranged so that when struck into the animal it is detached from the shaft and turns under the skin at right angles to the line. The harpoons of this arctic Alaskan area are then explained and figured in great detail by Murdoch.[1]

The same writer says that before the introduction of iron it was discovered that when the blade of the toggle harpoon is inserted parallel to the line hole the toggle head is less liable to pull out. At any rate, by a kind of necessity, the blade part of the oldest forms is transverse to the line hole. Also, by the exigencies of the broad body of bone and ivory, the blade of the Amur and eastern Eskimo regions is inserted parallel to the line hole.

Late in the autumn, when the pack is driven toward the land by the north wind, the ice forms rapidly. The hunters travel over it, as soon as it will bear their weight, to look for the "alloos," or breathing places, formed in the new ice when quite thin; this is gently raised by the animal's head into a slight mound, and a small hole opened with its nose and breath. These spots would escape notice were it not for the congealing of the breath forming a little hummock of hoar frost on the surface. It is this which reveals to the hunter an "alloo," or breathing place of a seal. Every seal has not its own breathing places, but more probably the instinct of the animal causes it to form many when the ice is thin, and many are frozen up for want of attention. Later in the season, as the ice grows thicker, it floats higher, leaving a larger and longer air space beneath, as the seal, when it visits the "alloo," scratches away the ice on the under side.

By these places the hunter takes his position, and, for fear the seal will catch the scent of his person, he carries a small three-legged stool on which he squats, taking his position on the lee side of the seal hole, watching and listening for the game. Of course he can not see the seal, but if there is a little wind he can see the vapor of its breath and hear the slight ripple in the water caused by the act of breathing.

When the hunter discovers the presence of the seal, his spear is sent crashing through the thin dome of ice into the animal, and so small

[1] Point Barrow Expedition, 1892, pp. 218–240.

are the quarters that the seal is seldom missed. The ice is then broken away and the hole enlarged until the game can be removed, this work being done with the ever-present ice pick.

The implements used in this method of hunting seal are a harpoon, to the staff of which is attached an ice pick, a line, and a stool to stand on. The stool serves the purpose of keeping the feet of the hunter dry, for newly formed ice is always very damp, and the long, patient waiting by the alloos would wet the feet of the hunter, after which he could not remain because of the intense cold, for furs are little protection if wet. At this season open water is formed by the current moving the ice, which presses together, leaving small spaces of open water. Seal passing these spaces will often come to the surface to breathe, and at such times fall an easy prey to the hunter's rifle and retrieving harpoon.

I am indebted for the information given above to Captain Herendeen, who lived many years at Point Barrow. He also says that whale fishing is carried on in the months of April and May.

On arriving home from the great spring reindeer hunt, about the 1st of April, the Eskimo have a few days of feasting and consultation. The wooden dishes of steaming venison are carried to the council house, "Cuddigon Igloo," where the men are gathered to talk over the coming whale hunt, and the sages tell of the conditions of ice required to make a favorable and successful season.

The wooden part of everything that is put into the umiak or freight boat is whittled or scraped off clean and smooth, so that the wood looks bright and new.

The women prepare the sealskin floats or pokes, as they are called by the American whalemen, as follows: A seal is captured and the skin cut around the head near the eyes. When the skin is cut free from the blubber and turned back, and the flippers are reached, they are unjointed near the body of the seal and the process continued until the carcass is removed. The blubber is scraped clean from the flesh side of the skin, and the bones carefully removed from the flippers. This is a delicate piece of work, for to cut the skin would ruin it for a float. After this is accomplished all natural vents to the body are closed by tying them around an ivory stud made for the purpose. Through one of these a hole is drilled to inflate the poke. The neck is passed over a stick about 6 inches long by 1 inch in diameter, then sewed up and the stick brought up to the seam and very firmly lashed with braided sinew. The poke is now blown up and stretched as much as possible by rolling and standing on it. Again it is scraped to remove the oil, and hung up in its inflated state to dry. After a few days it is oiled with the oil from the stone lamp. This dries more quickly than raw oil, and when dried again a coating is formed which is quite impervious to water. The lashing is now removed from the

neck, the skin carefully turned hair side out, a permanent lashing put on the neck and stick, when the poke is blown up again and is ready for use.

The harpoon line is made of walrus hide, very strong and often double. Its end is made fast around the lashing between the stick and the poke. Two pokes are used on the harpoon line, which terminates in a bridle. Still another poke is used as a trailer, the harpoon line being not more than 5 fathoms in length. The third poke or trailer has a small line 15 or 20 fathoms long. This trailer keeps on the surface and tells the hunters the position of the whale, thus making the pursuit much easier.

The harpoons used are to be found in the U. S. National Museum collection. The staff is about 10 feet long, tapering at each end. It is never thrown, but thrust into the whale, and great force is needed to drive this rather bulky instrument through the tough fibrous blubber when the cutting portion is formed of stone, as was always the case before the advent of the white man. These people are so governed by superstitions that they fear dire disaster would overtake them if they did not use the stone cutting points of their fathers on the first whale; after that they can use what seems best for the occasion.

The other implements to complete the outfit of an umiak are as follows: Three pokes well inflated and ready for use, and from three to five more all ready to be blown up; a paddle for each person, the one used for steering being much larger than the others; an implement for bailing the umiak, made of the reindeer antler, as it is very desirable to remove the water as soon as possible after it leaks in; a long knife, fixed on a pole 10 feet in length, for cutting blubber and lean meat under water; three gaffs (hooks on poles) of different lengths, varying from 6 to 12 feet, the hooks of ivory; these are useful to hook on to the portion of flesh to be cut off; a little bag with plugs whittled out to put in the mouthpiece used to inflate the pokes; these plugs are often broken, and an extra one must be kept on hand; a large wooden scoop to bail when a quantity of water gets into the umiak; a spare whale harpoon; a crutch to lash in the prow of the umiak to rest the harpoon on; the two tips of this rest are carved in a rude semblance to a whale's head; the skin of a crow, some eagle feathers, and a little earth in a small bag from the grave of some noted whale hunter, for good luck; some of these crow skins have been used many years and are in a most dilapidated condition, but are highly esteemed, for they have been present at the death of many a whale; great wisdom is accredited to the eagle and the crow, and it is considered quite the proper thing to use this talisman in order to overcome the cunning of the whale; a couple of toggles made of ivory, in the shape of a whale; and straps to lash the pectoral fins of the whale when towing, so the fins will not drag heavily through the water; a bag of provi-

sions. The men of the boat's crew carry their guns to shoot passing seals during the weary wait for the whale to come. Two women will be found in most crews. Each woman carries a sealskin bag to thaw out the snow for drinking purposes; the snow is put in the bag and its mouth firmly tied; it is then placed on her back between the inner and outer coat. The women also have their sewing outfits, to mend any breaks in the umiak.

In hunting through the ice the Eskimo of Point Barrow used a different shaped harpoon, with a long ivory piece on each end and a smaller head. As the seal comes up to blow they hurl this spear through the hole; then they drown the seal. After the animal is dead they haul it through the ice, picking the ice away until the hole is large enough to get the seal out. The animals do not freeze quickly, because they have such a coating of blubber. (Mr. Charles Browers.)

A combined barbed and toggle harpoon head (Cat. No. 1328, U.S.N.M.) of antler, from the Mackenzie River district, is shown in fig. 62. Body sagittate, tapering to a flat angular tip. Blade of iron, with a long rectangular tang and a triangular point with slight projections at its base. The tang is snugly fitted into the slit and held by an iron rivet. There is a line hole at one angle of the point, but it may have been there previously, since these Eskimos especially work up all the old iron they get their hands on.

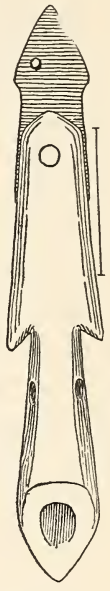


Fig. 62.

BARBED AND TOGGLE HEAD.

Mackenzie River.

Collected by C. P. Gaudet. Cat. No. 1328, U.S.N.M.

Line hole straight through the body behind the lateral barbs, and without slight grooves. Barbs, three; two on the sides, on an arrowhead, ornamented with longitudinal lines, and one terminating the back in a point. Socket half an inch deep. Butt end having two faces, the lower almost at right angles with the body, the upper whittled thin under the barb. Length, $3\frac{3}{4}$ inches. Collected by C. P. Gaudet. To this special type belong also many other examples. The National Museum is under infinite obligations to Messrs. Robert MacFarlane, B. R. Ross, and R. Kennicott for Mackenzie River materials.

A barbed seal harpoon (Cat. No. 16675, U.S.N.M.) for throwing stick. The shaft is of light pine wood, tapering backward, and is slightly thickened at the butt end. It is attached to the foreshaft by means of a socket and shank on the foreshaft. The foreshaft is of whale's bone, cylindrical. The tang is a plug cut on the end of the bone, fitting into the socket of the foreshaft. A hole is bored through the tang, through which the assembling line passes to hold the two parts together. The socket for the point is elliptical in section. No feathers are used. The point is of bone, delicate in form. Shank

oval in section. Barbs, three on each margin. Line hole oblong. The line is of rawhide, one end fastened through the line hole by a triple splice. About midway the line is split and the two ends are fastened as a martingale—one around the shaft near the foreshaft, the other 18 inches from the butt end, both by a clove hitch. The assembling line on this specimen is short. It is pressed into the wood just below the juncture with the foreshaft and passes forward, then through the perforations in the foreshaft and backward, where it makes three clove hitches and then is continued backward, where the upper end of the martingale is attached, and is fastened off by a half hitch, the end being pressed into the wood. This specimen is from Kotzebue Sound, collected by W. H. Dall. Length of shaft, 49¼ inches; foreshaft, 5 inches; point 2¾ inches.

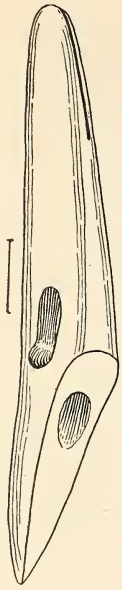


Fig. 63.
TOGGLE HEAD.
Diomede Island,
Collected by E. W. Nelson. Cat. No. 38775, U.S.N.M.

A large toggle head of a harpoon without blade (Cat. No. 38775, U.S.N.M.), from Diomede Island, is shown in fig. 63. It is of a typical form. The body is high and narrow, elliptical in outline, but having flattened faces here and there. The line hole is cut straight through, and is a flat ellipse in outline, 1⅛ inches long and three-eighths inch wide, with no attempt at line grooves. There is one immense barb formed by the back prolonged, ridged, and cocked up. The shallow socket is in a long cut or chamfer forming the butt end. Length, 8¼ inches. Collected by E. W. Nelson. To this same class of long, slender heads with large line hole belong the following specimens, with polygonal cross section.

Cat. No. 48589 (fig. 64), from Kotzebue Sound, collected by Nelson, is a little model in walrus ivory of a precisely similar head, with perpendicular blade and very long bevel at the butt end.

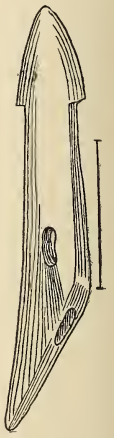


Fig. 64.
MODEL OF TOGGLE HEAD.
Kotzebue Sound.
Collected by E. W. Nelson. Cat. No. 48589, U.S.N.M.

A typical Alaskan walrus toggle head (Cat. No. 49167, U.S.N.M.), from Diomede Island, is shown in fig. 65. The body is of walrus ivory, conoid, with sloping faces on the back. Blade of iron, large in proportion, square at the base, set 1½ inches into the slit, and held by a bone pin.

Line hole oblong, straight through, widened behind, and flanked by two short grooves. Barb, one, angular; socket for the end of the shaft half an inch deep. Butt end cut off in a plane slightly warped at the socket. Length, 5 inches. Collected by E. W. Nelson.

A toggle head of a whale harpoon (Cat. No. 56601, U.S.N.M.), from Point Barrow, Alaska, collected by Captain Ray and described by Murdoch (1892, p. 238), is shown in fig. 66. Specimens of this kind are made for the market. The blades are triangular, the corners somewhat rounded off. The body is of coarse whale's bone, from the rib or jaw. Only two out of a large number collected by Ray are of ivory. The blade of this example is of brass, set into a saw cut in the end of the body and held in place by a bone rivet. The body is somewhat quadrangular in section, the line hole is well back from the blade, and the body widens from the front to this point. The line grooves extend outward beyond the base. The single spur is long and inclined upward. The base, contrary to the usual pattern, is somewhat convex. In the great mass of toggle harpoons the base is either concave or formed by two planes which make a different angle with the axis of the specimen. But in this case the contrary is true. The socket for the foreshaft is wide and deep.

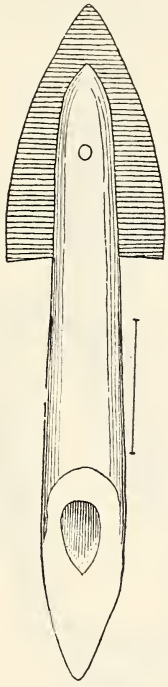


Fig. 65.

TOGGLE HEAD.

Diomede Island, Bering Strait.

Collected by E. W. Nelson Cat. No. 49167, U.S.N.M.

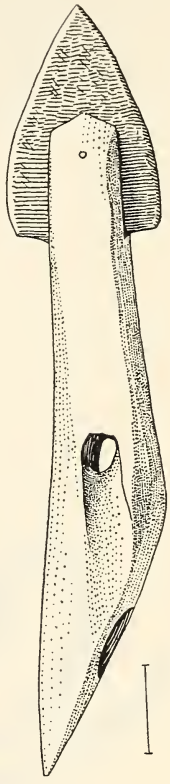


Fig. 66.

TOGGLE HEAD OF WHALE HARPOON.

Point Barrow.

Collected by P. H. Ray. Cat. No. 56601, U.S.N.M.

Fig. 67.

TOGGLE HEAD.

Point Barrow, Alaska.

Collected by P. H, Ray. Cat. No. 56614, U.S.N.M.

A small toggle head (Cat. No. 56614, U.S.N.M.) of bone, from Point Barrow, for catching seal, is shown in fig. 67. Body conoid, flattened laterally. Blade lanceolate, just fitting at its base into the slit of the head and fastened with an iron rivet. Line hole straight through and flanked by deep grooves. Barbs, two, formed by a file cut in the back. This is a common practice on hundreds of modern specimens. Socket for the shaft shallow and distinctly margined. Butt end formed by the meeting of two planes. Length, 3 inches. Collected by P. H. Ray.

A new style toggle head (Cat. No. 56620, U.S.N.M.) from Point Barrow, is shown in fig. 68. A large number of specimens of this type were brought home by the Ray expedition. The body is of antler and the blade is set into the saw cut at right angles to the plane of the body, barbed. The line hole is in the plane of the blade. The socket for the foreshaft divides the base into two parts with different slope, the one nearly perpendicular, the other with a slight angle, so as to form the barb. Of this specimen Murdoch says, "It is a newly made model in reindeer antler of the ancient harpoon, but evidently by a man used to modern patterns, so that the blade is set in at the wrong angle."

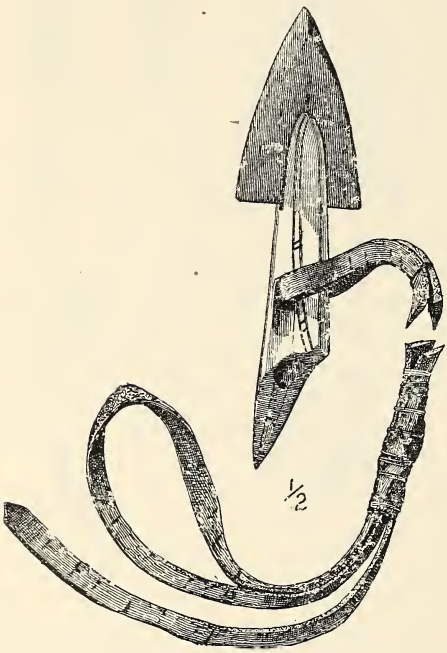



Fig. 68.

TOGGLE HEAD WITH LEADER.

Point Barrow.

Collected by P. H. Ray, after Murdoch.
Cat. No. 56620, U.S.N.M.

Walrus harpoons (Cat. Nos. 56670 and 56672, U. S. N. M.) from Point Barrow, Alaska, collected by P. H. Ray, are shown in figs. 69 *a* and *b*. The shaft of the former is of spruce, 71 inches long, rounded, and tapering from the middle in both directions. The club-shaped foreshaft is of ivory and has a wedge-shaped tang which fits in a cleft at the end of the shaft. The shaft and foreshaft are fastened together by a whipping of seal thong put on wet, one end fastened through a hole in the shaft, and the whole kept from slipping by a ridge on each side of the tang. In the tip of the foreshaft is a deep round socket to receive the loose shaft, a tapering rod of walrus ivory, secured by a piece of seal thong passing through a transverse hole above the shoulder. One end is spliced to the thong; the other end makes a couple of turns outside of the lashing between the shaft and the foreshaft. On the side of the shaft and just above the middle is a line catch.

No. 56772 is a similar togglehead harpoon with the line hole in the plane of the blade, foreshaft with square base, spindle-shaped foreshaft, leader looped into the line hole and doubled at the outer end, to be spliced with the end of the line. On the shaft is a hook to be used in tightening the apparatus when the head is in place and also a stop

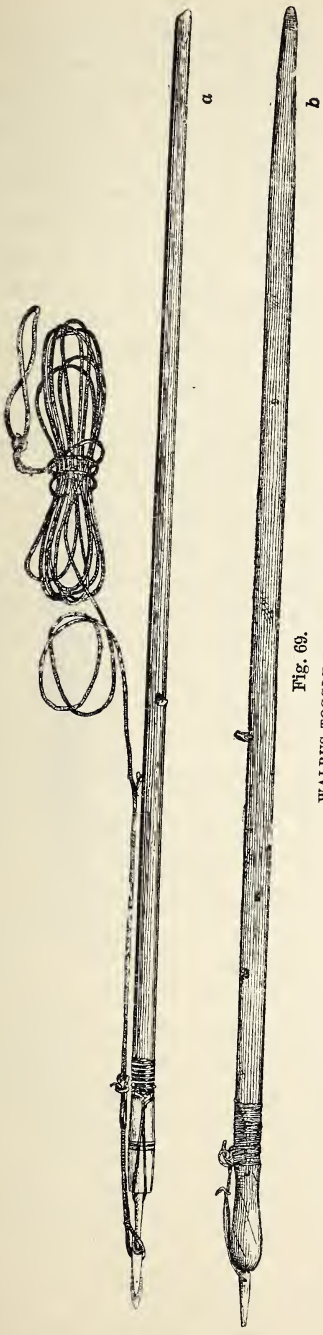



Fig. 69.

WALRUS TOGGLE HEAD HARPOONS.

Point Barrow.

Collected by P. H. Ray, after Murdoch. Cat. Nos. *a*, 56770; *b*, 56772, U.S.N.M.

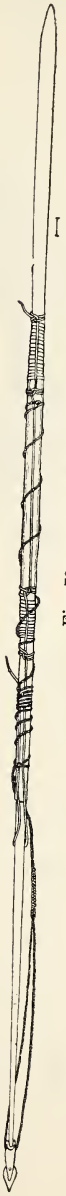


Fig. 70.

SEALING HARPOON.

Point Barrow.

Collected by P. H. Ray. Cat. No. 56774, U.S.N.M.

for the hand in thrusting. The details of this specimen are carefully worked out by Murdoch (p. 225).

A sealing harpoon (Cat. No. 56774, U.S.N.M.) from Point Barrow, Alaska, collected by P. H. Ray, is shown in fig. 70. With respect to the use of this implement, Murdoch says that as the seals come up for air to their breathing holes or cracks in the ice a harpoon is used which has a short wooden shaft armed with an ice pick, and a long, slender loose shaft suitable for thrusting down the small breathing hole. It carries a toggle head, but has only a short line, the end of which is made fast permanently to the shaft. Such harpoons are used by all Eskimo wherever they are in the habit of watching for seals at their breathing holes. The foreshaft is simply a stout band for the end of the shaft; the loose shaft is of bone and has two holes to receive the end of the assembling line, which not only holds the loose shaft in place, but connects the other parts of the shaft so that in case the wood breaks the pieces will not be dropped.[1]

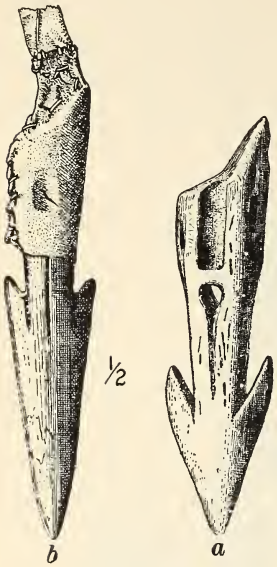



Fig. 71.

OLD BARBED AND TOGGLE HEADS.

Point Parrow.

Collected by P. H. Ray, after Murdoch. Cat. Nos. *a*, 89331; *b*, 8954, U.S.N.M.

An old bone harpoon head (Cat. No. 89331, U.S.N.M.) from Point Barrow, which is a compromise or transition between the barbed harpoon head and the toggle head, is shown in fig. 71*a*. Two long barbs on the margins are bilateral and symmetrical. Blade transverse to line hole, as in the small seal dart heads. The shaft socket groove is flanked on its margins with slots, through which a thong may have passed to complete the apparatus. Two specimens are figured by Murdoch. Length, 4¼ inches. Collected by P. H. Ray, U. S. A.[2]

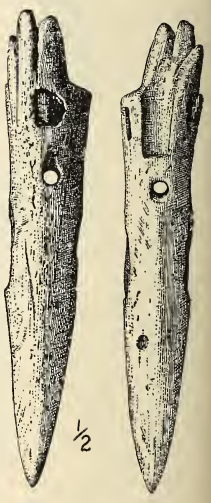



Fig. 72.

OLD TRANSITION HARPOON HEAD.

Point Barrow.

Collected by P. H. Ray, after Murdoch. Cat. No. 89337, U.S.N.M.

Murdoch calls attention, in fig. 71*b*, to the similarity of No. 89544, U.S.N.M., to a harpoon head collected by Nordenskiold at the ancient Onkalon house at North Cape.[3]

[1] Ninth Annual Report of the Bureau of Ethnology, fig. 239.

[2] Sixth Annual Report of the Bureau of Ethnology, p. 220, fig. 209 *a* and *b*.

[3] Ninth Annual Report of the Bureau of Ethnology, fig. 211, p. 220, quoting Voyage of the Vega, I, p. 444, fig. 5.

A bone harpoon head (Cat. No. 89337, U.S.N.M.) from Point Barrow is shown in fig. 72. It marks a step in the transition from barbed head to toggle in that the barbs are absent; a slot on each margin of the body marks the places where they might have been inserted. The line hole is transverse to the blade. The barb of the toggle head is four-pronged and sits awry with reference to the blade. Length, 4½ inches. Collected by P. H. Ray, U. S. A.[1]

A combined barbed and toggle harpoon head (Cat. No. 89377, U.S.N.M.) from Point Barrow, rhomboidal in section, conoidal behind the barbs, body all in one piece, of bone or antler, long, slender, tapering from butt to point like a lance blade, is shown in fig. 73. When the line hole is horizontal the blade is vertical. The line hole is a small round perforation. Line grooves, narrow; furrows, uniform.

There were at one time, possibly, barbs on the margins of the blade, for there exists on each, at a distance of 2 inches back from the point, a groove seven-eighths inch long, three-eighths inch deep, and less than one-eighth inch wide, undercut in front. Into this groove or slat could have been inserted marginal barbs of bone, or perhaps of stone. The barb at the butt end is made up of a series of four-lobed projections of different lengths.

The socket is a squared mortise into the bone, with one side quite open. On the margins of this space elongated slots are cut into an open, depressed space on the back, and the socket is completed by coiling around through them a string of animal tissue.

With this specimen should be compared an example from North Cape, with top and bottom barb, oblong line hole decorated by furrows along the sides toward the tip, terminating in two branches and a cross line.[2] Length of 89377 is 5 inches. Collected by P. H. Ray.[3]

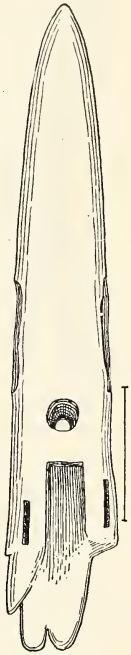


Fig. 73.
BARBED AND TOGGLE HEAD.
Point Barrow.
Collected by P. H. Ray. Cat. No. 89377, U.S.N.M.

A combined barbed and toggle harpoon head (Cat. No. 89378, U.S.N.M.) from Point Barrow, of antler, all in one piece, is shown in fig. 74. The body is long, slender, and angular in its outlines, a flat triangle in section in front and pentagonal behind the barb. Line hole straight through very near the butt end and parallel to the plane of the point and lateral barbs. Line grooves deep cut for a small rawhide line.

There are three barbs, one on each margin, acute, the opening two-sided; the rear barb is a sharp termination of the rigid back. Socket for

[1] Ninth Annual Report of the Bureau of Ethnology, p. 220, fig. 210.
[2] A. E. Nordenskiold, Voyage of the Vega, New York, 1882, p. 335.
[3] Ninth Report of the Bureau of Ethnology, p. 220, fig. 210.

the shaft half an inch deep, butt end cut off, with two faces and a ridge in the middle. Length, 5⅛ inches. Collected by P. H. Ray. It is well known that all such angular material has been made with steel tools. The only attempt at decoration is a series of four short grooves extending forward from the angles of the lateral barb—a common feature in Eskimo art.

Fig. 74.
COMBINED BARBED AND TOGGLE HEAD.
Point Barrow.
Collected by P. H. Ray.
Cat. No. 89378, U.S.N.M.

An ivory harpoon head (Cat. No. 89379, U.S.N.M.) from the Eskimo camp near Point Barrow, which marks that step in the transition from the barbed head to the toggle head in which the line hole, line grooves, and shaft socket of the latter are complete, is shown in fig 75. Length, 5 inches. Collected by P. H. Ray.[1] It is compared by Murdoch with a Chukchi form.[2] The blade is long and tapers backward from the tip to the equal barbs, giving to this part of the specimen the form called sagittate, and occupying two-thirds of the length of the head. The tang of the blade and barbs expands to form the body, through which the line hole passes directly, perpendicular to plane of the blade. The line grooves are straight and uniform in depth. The body widens from the barb on the side that is to become the spur or rear barb, the other side being straight. The shaft socket is in perfect alignment, and the base is a single gracefully curved plane to the point of the spur.

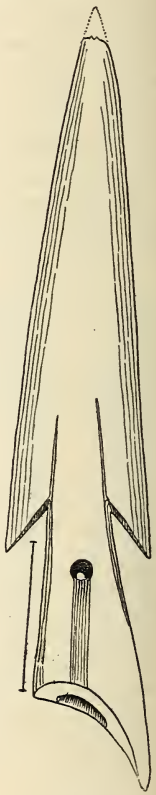


Fig. 75.
BARBED AND TOGGLE HEAD.
Point Barrow.
Collected by P. H. Ray.
Cat. No. 89379, U.S.N.M.

A curious fragment of a combined barb and toggle harpoon head (Cat. No. 89381, U.S.N.M.) is shown in fig. 76. The parts are all from one piece of ivory; the barbed head is transverse to the line hole, the line hole is somewhat triangular, and the specimen is much discolored and disfigured, showing that it is old. Either owing to the poverty of material or on account of breakage, the after part of the toggle head is too narrow for a socket to the foreshaft. In order to remedy this defect the Eskimo hunter has made a furrow or cavity

[1] Figured by Murdoch in Ninth Annual Report of the Bureau of Ethnology, p. 220, fig. 211.

[2] A. E. Nordenskiold, Voyage of the Vega, New York, 1882, p. 335.

on the side and cut square holes in the margins of this cavity, through which a rawhide line could be run several times, and this would serve the purpose of the socket. This device may be seen on one other specimen in the collection. Collected by Philip H. Ray, Point Barrow.

An old harpoon toggle head (Cat. No. 89382, U.S.N.M.) from Nuwuk, in the Point Barrow region, made of bone, all in one piece, is shown in fig. 77. In fact, it is a barbed head, like that of the seal dart, becoming a toggle head. The part answering to the blade is a point on the bone with a single barb on the lower side or belly. From the base of the barb the body widens to the butt end. The line hole is transverse to the blade. The butt is cut off diagonally. The socket is wanting, but the bone is concave on one side. Mr. Murdoch thinks that a socket was provided by the lashing, as in Example 89381.[1] Length, 3 inches. Collected by P. H. Ray.

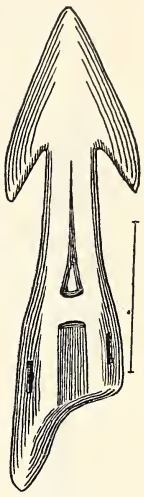


Fig. 76.
COMBINED BARBED AND TOGGLE HEAD.
Point Barrow.
Collected by P. H. Ray.
Cat. No. 89381, U.S.N.M.

An old-style toggle head (Cat. No. 89748, U.S.N.M.) for a harpoon is shown in fig. 78. The body is of bone, quadrangular in section. The head is of chipped stone, with a tang set into the kerf in front of the body and held in place not by a rivet, but by a lashing of sinew twine. The line hole is at the extremity of the body, where it begins to taper to the spur or barb, which is slightly bifurcated at its outer end. This is called an old-fashioned specimen because the blade of stone is in the plane of the greatest width of the body and is bisected by the line hole.[2]

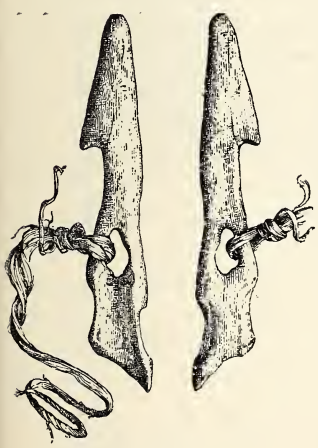


Fig. 77.
OLD TOGGLE HEAD.
Point Barrow.
Collected by P. H. Ray, after Murdoch.
Cat. No. 89382, U.S.N.M.

A retrieving seal harpoon (Cat. No. 89907, U. S. N. M.) from Point Barrow, collected by Ray, is shown in figs. 79 and 80. This specimen was supposed by Murdoch to have been invented after the introduction of the rifle, but in his description[3] he makes the remark that though it is used at the present day for nothing but retrieving, the fact of similar specimens having been brought by the officers of the *Blossom* shows that

[1] Ninth Annual Report of the Bureau of Ethnology, p. 219, fig. 208.
[2] Idem, p. 221, fig. 212.
[3] Idem, p. 231.

it antedated the rifle. Such a retrieving harpoon is called nauliga. The shaft (ipúa) is of ash, 4 feet 5 inches long and 1 inch in diameter, tapering very slightly to each end. The ice pick (túu), of walrus ivory, 14 inches long and 1 inch wide, has a round tang fitting into a hole in the butt of the shaft. Close to the shaft a small hole is drilled in one edge of the pick, and through this is passed a bit of seal thong, the ends of which are laid along the shaft and neatly whipped down with sinew braid, with the end wedged into a slit in the wood. The foreshaft (ukumailuta) is of walrus ivory, 4½ inches long and 1½ inches in diameter at the thickest part, and secured to the shaft by a whipping (nĭ'xma) of seal thong. The loose shaft (ígimû) is also of ivory and 2 inches long, and secured by a thong (ĭpíuta) spliced into a loop through the hole at the butt, as previously described. The end is hitched round the tip of the shaft with a marlin hitch, followed by a clove hitch below the whipping. The ivory finger rest (ti'ka) is fastened on with a lashing of whip cord (white man's) passing round the shaft. The line catch (ki'lerbwĭñ), which was of ivory and shaped like those on the walrus harpoons, has been lost in transportation. The head differs only in size from those intended for the bearded seal, except in having a hexagonal body. It is 3.3 inches long and has a blade of iron fastened into a body of walrus ivory with a single wooden rivet. While there is no detachable leader, the head is attached by a separate piece of the same material to the line (tûkăksia), which is 86 feet 10 inches long and made of a single piece of fine seal thong about one-eighth inch thick. This shorter piece is about 27 inches long, and is passed through the line hole and doubled so that one part is a little the longer.

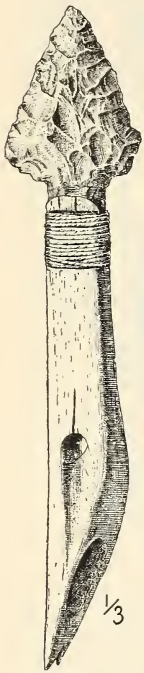



Fig. 78.
OLD STYLE TOGGLE HEAD.
Point Barrow.
Collected by P. H. Ray, after Murdoch. Cat. No. 89748, U.S.N.M.

It is fastened strongly to the end of a line by a complicated splice made as follows: A slit is cut in the end of the main line, through which are passed both ends of the short line. The longer part is then slit about 2 inches from the end, and the shorter part passed through the slit, and a slit cut close to the end of it, through which the longer end is passed. The whole is then drawn taut and the longer end clove hitched round the main line.

Catalogue No. 129585 in the U. S. National Museum is a barbed harpoon (for throwing stick) from Cape Blossom, and collected by Capt. M. A. Healy, of the U. S. Revenue Marine. The shaft is of light pine wood, tapering back toward the butt end. It is socketed to receive the shank or tang of the foreshaft, which is plug-shaped and

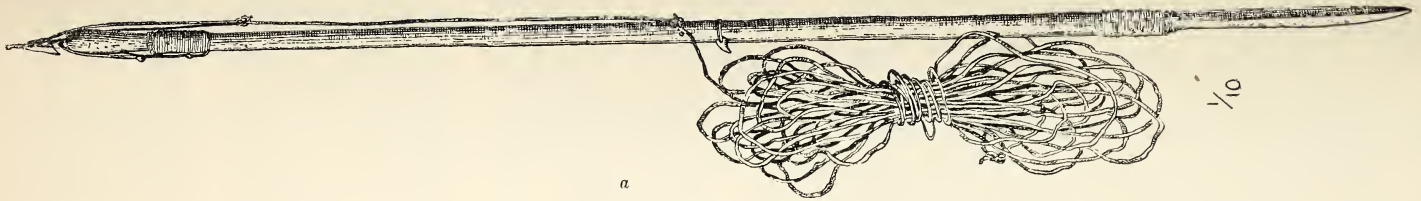



Fig. 79.

RETRIEVING HARPOON.

Point Barrow.

Collected by P. H. Ray, after Murdoch. Cat. No. 89907, U.S.N.M.

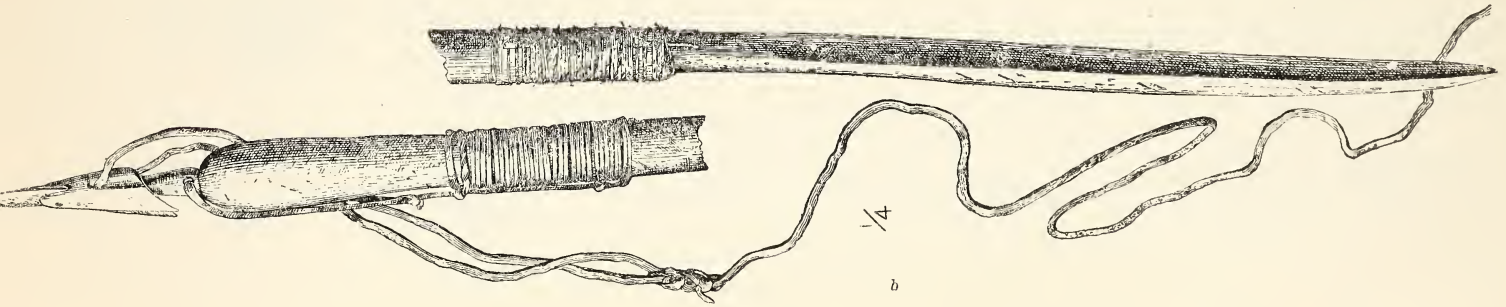



Fig. 80.

Detail of Fig. 78, after Murdoch.

fitted in, all being held together by sinew braid. The foreshaft is of whale's bone, cylindrical. The socket for the point is oblong. Feathers, two, especially noteworthy. The tip end of a half feather is punched into the wood near the neck, bent at right angle and carried forward and lashed down by the assembling line. The fibrous part of the feather is on the inside, between the rib and the shaft of the harpoon. This style of feathering is seen on example 48153, from Sledge Island, with three feathers; on 34020, from Norton Sound, and on several specimens from Golofnin, and does not occur any farther south. The point is of bone, concave on one side and convex on the other. Barbs, three on one margin and two on the other. The tang of the point is wide and flat. The line is of seal hide; martingale formed by splitting the line in the middle and tying the two ends to the shaft. There are two assembling lines—one extending from the upper knot of the martingale to the joint of the shaft and foreshaft, where it forms the seizing between the two; the other begins with the lower knot of the martingale, where one end of sinew thread is punched into the wood, passes backward, and is fastened off by a clove hitch. It then returns to the starting point, where it is again fastened off, and goes on to the feather by a series of turns and half hitches, laid on much as the sinew on the sinew-back bow. This is very interesting. Length of shaft, 44 inches; foreshaft, 4½ inches; point, 2 inches.

Example No. 129574, in the U. S. National Museum, is a barbed harpoon from Cape Krusenstern, Kotzebue Sound. The delicate shaft is conical in shape, tapering from the foreshaft backward, and slightly flattened in its thicker portion. It is socketed in the larger end for the reception of the foreshaft, and slightly stained red.

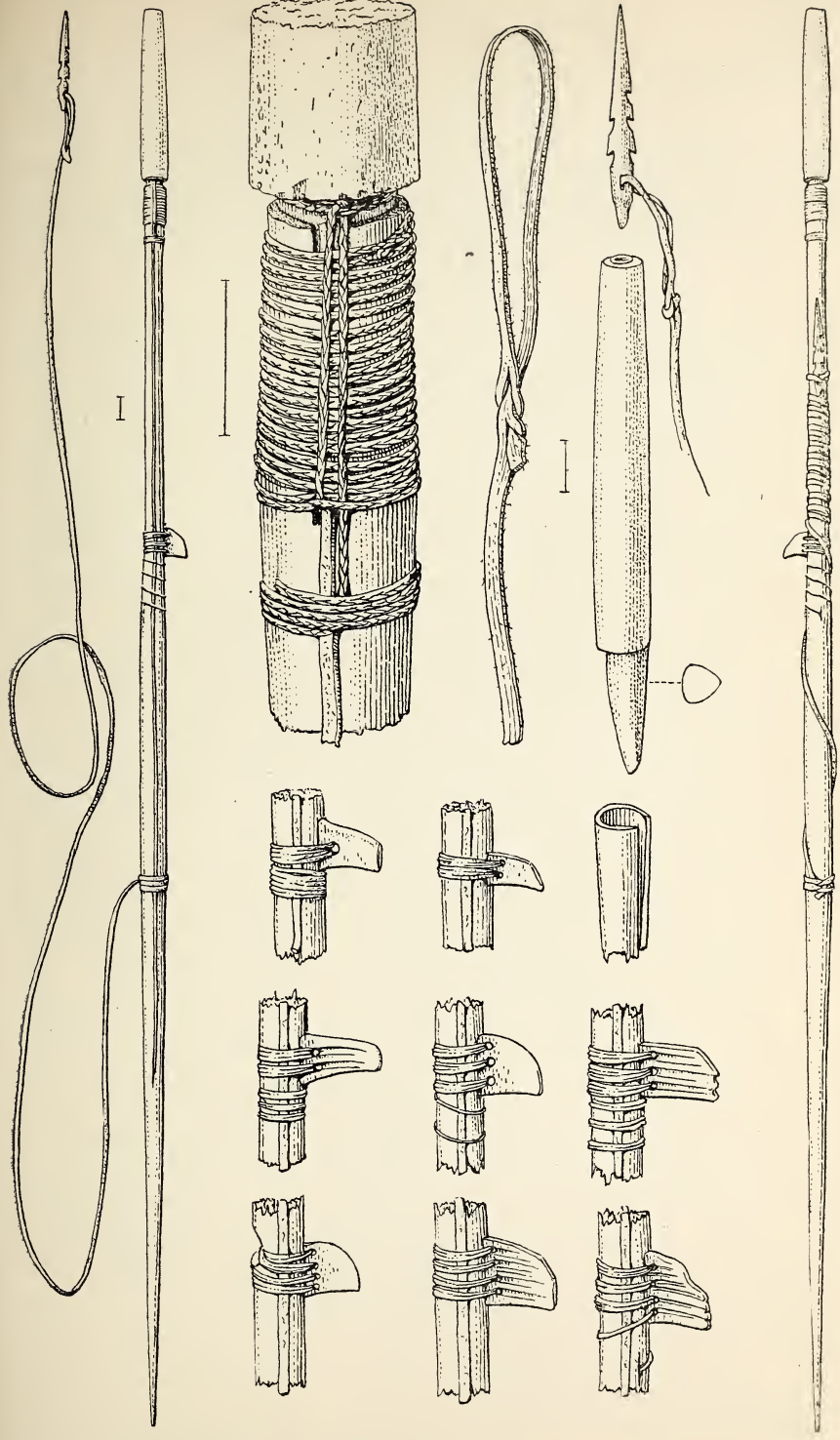
The foreshaft is of whale's bone, cylindrical in shape. The tang fits in the open socket of the shaft, and on the outside the two bodies are trimmed down so as to form one continuous surface. Seizing of sinew twine. The socket for the point is quite large and extends across the wooden plug inserted in the end of the bone.

The hand rest is a slight hook of ivory set in the shaft, pierced with one triangular hole and held by a wrapping of sinew thread, which is also continued around the shaft a dozen times and fastened off by being punched into the wood.

The point is of bone, flat on one side and rounded on the other. Broad shank. Line hole almost circular. Barbs, three on one margin and two on the other. On the flat side of the point a shallow gutter is cut from the line hole forward.

The line is of seal skin. One end passes through the line hole and is fastened by a common slip knot; the other end is made fast to the shaft, about 9 inches behind the hand rest, with a clove hitch of three turns.

The assembling line is of rawhide, one end caught under the seizing



BARBED HARPOON, WITH HAND RESTS, ST. MICHAEL ISLAND, ALASKA.
Collected by E. W. Nelson.
Cat. No. 36068, U.S.N.M.

between the shaft and foreshaft, and the other end pressed into a groove in the wood and held by a small wedge.

This delicate specimen is the only example of the class of barbed harpoons with hand rest coming from a point north of Bering Strait. Length of shaft, 4 feet 3 inches; foreshaft, 7 inches; point, 3 inches. Collected by Capt. M. A. Healy, of the U. S. Revenue Marine.

### HARPOONS OF BERING SEA.

The harpoons of this area were fully described and figured by Nelson in 1899, who had the advantage of having seen the specimens at work. The massive harpoons of Greenland and the central Eskimo are wanting here, but the greatest variety of forms and parts is to be found. Again, if the flat varieties of eastern Asia, with line hole in the plane of the blade, are the more aboriginal, their nearest kin are to be seen, not in Bering Sea, but around Greenland. It is as when an Oxford professor, wishing to know something of his old-time kin, visits, not the nearest English town, but the heart of some New World colony. The Bering Sea Eskimo have been profoundly affected by the vigorous prosecution of the fur trade during the past century and a half. The possession of steel tools has revolutionized their fine art; but, fortunately for this study, the harpoon has kept more loyally to its ancient models. There are barbed varieties, toggle varieties, and some are mixed. There are those which are thrust with the hands, others are hurled from the hand, and very many are cast from throwing sticks. Of this last-named implement a number of type forms are to be seen between Mackenzie River and Sitka. Here also will be found feathered harpoons, those with bladders attached to the shaft, and harpoon arrows. In the more southern portions of the Bering Sea area the harpoon attains a finesse in structure and appearance nowhere else seen. The collections from this area made by Nelson, Turner, Dall, Applegate, and Johnson are unparalleled for comparative study.

Among a large collection of these seal darts or barbed harpoons from Unalakleet, in the northeast corner of Norton Sound, a great majority have cylindrical foreshafts made of whale's bone, but one or two specimens have the heads of walrus ivory and the front end tapered in conical form. Farther south this characteristic is more abundant. Barbs on the points are three on one margin and two on the other, and two on one margin and one on the other.

According to Lucien Turner, the harpoon darts with very thick foreshafts and elongated bladders attached to the shaft are for salmon. They are confined to Bristol Bay and the south side of the Alaskan peninsula, so far as the U. S. National Museum is concerned.

Cat. No. 33859 in the U. S. National Museum is a barbed harpoon thrown from the hand by means of a hand rest on the shaft. Quite similar is No. 36068, as shown in Plate 8, described in Nelson, 1899

(p. 138). Unless otherwise mentioned the specimens described below were collected by E. W. Nelson.

The shaft is of soft wood, tapering backward to a point, oval in cross section, and stained red in the front portion. For the attachment of the foreshaft a roughly conical socket is excavated, and on the upper side of this socket a slot is cut through from the outside. In the harpoons whose foreshafts are attached in this way this slot is universal—that is, the tang of the foreshaft is not driven into a cavity which it fits, but is set in a cavity with two margins which can be driven close together by the shrinkage of the seizing.

The foreshaft is of whale's bone, nearly cylindrical, and cut off square in front. The tang is conoidal in form and terminates with a shoulder where it joins the body of the foreshaft. A plug of wood is inserted in the front end of the foreshaft, with a socket for the tang of the point. Feathers, none; but on the side of the shaft, just behind the center of gravity, is a flat piece of antler or bone set on and held in place by a lashing of rawhide thong. This serves as a stop for the end of the harpoon, the latter being driven like a javelin from the hand, without the use of a throwing stick of any kind.

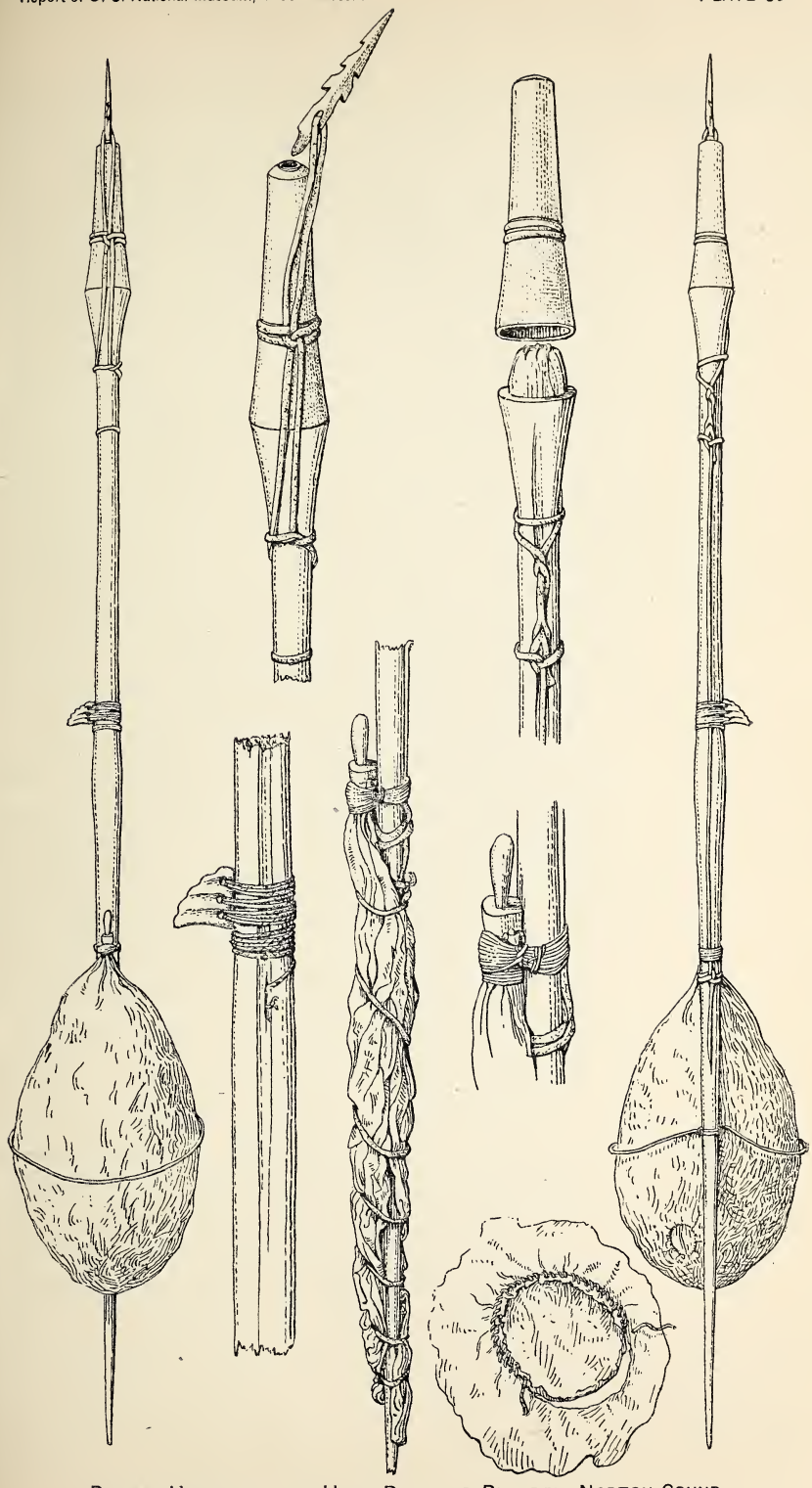
The point is of bone, flattened on one side and round on the other, much larger than that of the variety hurled with a throwing stick. The shank is a flattened cone. Barbs, three on one margin and two on the other. In all of this class of harpoons the edges or sides of the point are sharp, and the margins of the barb are straight on one side and curved on the other. The line hole is oblong.

The line is of rawhide thong, one end attached to the point and the other end to the shaft back of the middle by a clove hitch.

The assembling line is fastened around the tang of the foreshaft near the shoulder and is continued back underneath the lashings, of different kinds, to near the top end, where it is driven into the wood and forms a smooth fastening.

Length of shaft, 52 inches. Length of foreshaft, 8 inches. Length of point, 4 inches. This specimen is from St. Michael. Collected by E. W. Nelson.

A toggle-head harpoon (Cat. No. 33888, U.S.N.M.) from Norton Sound is shown in fig. 81. The head is of ivory. The noticeable features about it are: The blade is in the same plane as the line hole; the line hole goes directly across the body of the head; the shallow socket is exactly behind it and in a line with the saw cut. There is a single barb or spur projecting behind the socket on top of the toggle head. The foreshaft is a long spindle of bone, tapering in front to fit the socket of the toggle head, and having a short cone at the base for the cavity in the end of the foreshaft. A hole is pierced through the foreshaft and a loop or becket passed through this opening and around the line, so that when the animal is struck the foreshaft is withdrawn from



BARBED HARPOON, WITH HAND REST AND BLADDER, NORTON SOUND.
Collected by E. W. Nelson.
Cat. No. 33933, U.S.N.M.

the head and remains attached to the line. This feature should be carefully noted. The shaft is of wood, the foreshaft of ivory, and swollen or bulbous at the outer end. It fits into the wedge-shaped cut on the end of the shaft and is held tight by a lashing of rawhide. This lashing continues the whole length of the shaft, being caught around it at intervals with half hitches, forming an assembling line. Attached to the shaft is a hand rest about the center of gravity and a sharpened piece of bone at the other end. The line from the toggle head, after passing through the loop on the loose shaft, is attached to the shaft about the middle, so that the latter forms a drag when the animal is once struck. This implement is not thrown by means of a throwing stick, but from the hand of a hunter. Collected by E. W. Nelson.

A barbed harpoon (Cat. No. 33910, U.S.N.M.) from the Norton Sound area, to be thrown from the hand and not from a throwing stick, is shown in fig. 82. The shaft tapers from the front to the rear end, and has a hand rest on the side, held down by sinew thread. The foreshaft is a cylinder of bone, and fits into the open socket of the shaft by means of a projection or tenon. The harpoon head is a barbed piece of bone. The line passes through the line hole in the head and is wrapped several times around the shaft, fastened off with a series of half hitches, and nearer to the butt end. The assembling line, in this example, is different from the one just described. When the animal is struck, the head is withdrawn from the foreshaft, the thong unwraps from the shaft, which stands straight in the water and acts as a drag to the captured animal. It is from St. Michael.

A barbed harpoon with hand rest (Cat. No. 33933, U.S.N.M.), from St. Michael, Alaska, is shown in Plate 9. The shaft is of pine wood, elliptical in section, pointed in the rear, widening toward the middle and then narrowing again toward the foreshaft. The foreshaft is of bone or antler, a flat cylinder in section and a truncated cone in outline. It has a hole in the base and is fitted over a projection or tenon in the end of the shaft. This method of joining is worthy of notice. The shoulder of the shaft forms a neat joint with the rear of the foreshaft. In the middle

Fig. 81.
TOGGLE HEAD HARPOON.
Norton Sound.
Collected by E. W. Nelson.
Cat. No. 33888, U.S.N.M.

of the body of the foreshaft a gutter is carved to receive the knot in the line. A hand rest on the middle of the shaft is triangular in outline, with a wavy margin and short flutings on the surface. It is pierced with three holes and set against the side of the shaft, where it is laid in place by wrappings of sinew thread. The fastening off of the lashing by being punched in the soft tissue of the wood is quite characteristic in Eskimo manufactures. The head has three barbs, one on one margin and two on the other, and is flattened on one side and angular on the other. The tang is flat and shouldered. The line hole is an oblong opening, just large enough to hold the rawhide thong and give it play. The line, which serves also for assembling line, is of stout sealskin. The small bladder is attached to the shaft. Its mouthpiece and lashings are well shown in the drawings.

Fig. 82.
BARBED HARPOON.
St. Michael Island.
Collected by E. W. Nelson. Cat. No. 33910, U.S.N.M.

Specimen No. 33948 in the U. S. National Museum is a bridle harpoon for a throwing stick, from the mouth of the Yukon River, collected by E. W. Nelson. The shaft is of light pine wood, top-shaped at the tip, suddenly narrowed, and then gradually widened to the butt end, where it is quite expanded. It is socketed for the shank of the foreshaft. The foreshaft is of ivory, attached to the shaft by a tang which fits into the socket. It is perforated just below the shoulder for the reception of a loop of rawhide, which is caught on either side under the seizing, binding the shaft and foreshaft together. This serves as an extra strengthening or as a retrieving device. The tip end of the foreshaft is tapered and a wooden plug inserted for the reception of the point. Two whole feathers are attached in the usual manner, punched into the wood, all their tip ends and the butt ends held down by a wrapping of the assembling line. The assembling line passes from the front end of the shaft to the inner end of the feathers. The point is of ivory, line hole oblong, tang conical, with a shoulder. Martingale of sinew string, the two ends fastened in the usual place—one near the foreshaft, the other back of the middle, fastened by a clove hitch. The assembling line acts as a lashing for the shaft and the foreshaft, passes backward by the regular series of half hitches, and is fastened off at the butt end as a seizing to the feathers. Especial attention is called to the hole near the tang of the foreshaft; a similar hole is found through the inner end of the

foreshaft near the tang. This peculiarity is almost entirely confined to the area between Cape Dall and Nunivak. Length of shaft, 46 inches; foreshaft, 5 inches; point, 3½ inches.

Specimen No. 33952 in the U. S. National Museum is a barbed harpoon without bridle for throwing stick, from Askeenuk, below Point Dall, collected by E. W. Nelson. The shaft is of light pine wood, nearly uniform thickness throughout, slightly expanded at the butt, and cut into a truncated wedge in front, which fits into a smaller slot in the foreshaft. The foreshaft is of ivory, almost cylindrical, and a little expanded in the front and tapering toward the tip, into which a plug of wood is inserted for the reception of the tang of the point. Into the butt end of the foreshaft is sawed a wedge-shaped slot on the ends of the wings. These formed projections are left for the lashing which joins the two parts together. The lashing is also held in place at the other extremity of the joint by shoulders on the foreshaft wrapped with sinew braid, which forms a strong joint. Three feathers are pressed into the wood near the butt end and wrapped with sinew braid at their inner extremities, the braid continuing to form the assembling line of the shaft. Here, as in other examples, a dozen or more turns are closely wrapped around the shaft about a foot from the end. The point is of bone. Barbs, three on one side and two on the other. Line hole oblong and quadrangular. Tang conical and shouldered. Through the line hole is fastened a narrow sealskin thong 3 feet or more long. This is attached by its other end around the shaft near the joint with the foreshaft by a clove hitch. When the point is driven into a seal by means of a throwing stick, the tang is withdrawn from the foreshaft, which sinks in the water, and the shaft floats with the feathers upward to act as a buoy and also as a drag to slacken the pace of the animal. Similar to this are Nos. 33950, 33949, 33954, and 33955. In all of these the line is fastened to the shaft near the foreshaft. Length of shaft, 44⅞ inches; foreshaft, 6½ inches; point, 3 inches.

Examples Nos. 34004, 34011, 34016, 34020, 34002, 34008, 34017, 34022, 34018, 34001, 34023, 34014, 34003, 34021, 33992, 33991, 33999, 33994, 33978, and 33995 in the U. S. National Museum are barbed seal harpoons for throwing sticks, and form a large collection of these objects from various places around Norton Bay. They have foreshafts of whale's bone, cylindrical, attached to the shaft by a shank fitted into a socket in the end of the shaft.

The shank of the foreshaft is somewhat wedge-shaped in cross section, the edge of which is run through a slot extending from the outside to the inside of the end of the shaft, to allow the shrinking of the sinew wrapping on the outside to bind all the parts strongly together.

Most of these specimens from this area have two feathers, though in some cases there is only one.

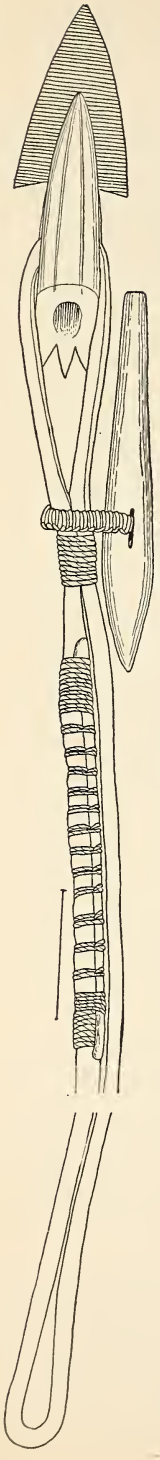


Fig. 83.
TOGGLE HEAD AND ACCESSORIES.
Kuskokwim River.
Collected by E. W. Nelson. Cat. No. 37380, U.S.N.M.

The head and contiguous parts of a small toggle harpoon (Cat. No. 37380, U.S.N.M.) for seal, from Chalitmut, collected by E. W. Nelson, is shown in fig. 83. The body of the head is of ivory, somewhat rectangular in cross section, but carved and flattened on both sides in parts of threes. The blade is set into a saw cut at the tip of the head and not held by any rivet. The socket for the loose shaft is a slender cone truncated within, the front end of the loose shaft being sawed off. The butt end of the body is beveled out. A long slope and three barbs are formed at the hinder edge of this bevel and ornamented with concentric circles and lines. The line hole passes straight through the body, as in many other examples of this type. The loose shaft is a spindle-shaped piece of bone, longer on the front slope. The hinder end is sharpened to fit into a groove. In the end of the foreshaft a hole is bored through the thick portion of the loose shaft, and through this hole and around the leader or line is formed a grommet of sinew cord. The two ends of the leader are overlapped and united by a notch.

A small toggle harpoon (Cat. No. 37395, U.S.N.M.) of the Alaskan Eskimo, at Chalitmut, on the north of Kuskokwim Bay, is shown in fig. 84. It is a type of the region and is made with a great deal of artistic skill. Blades are nowadays of brass, copper, and other metals, often of slate, inserted into a small toggle head of ivory transversely to the plane of the barbs, the plate intersecting the barb, which is bifurcated and sometimes trifurcated. The body is also ornamented with graceful lines, herring bone patterns, and circles. Into the socket of the headpiece is inserted the point of a small bone loose shaft, which fits by its lower end into a shallow socket of the foreshaft. Through the line hole of the head is a loop of rawhide, the ends neatly spliced together by a frapping with sinew string. The loose shaft is kept from being lost by a little grommet, made of sinew passing through

it and around the rawhide loop. The whole work of all these specimens is very neatly done. Length of head, $1\frac{3}{8}$ inches. Collected by E. W. Nelson.

Catalogue No. 37955 is a toggle head of seal harpoon. The parts of this specimen which are attached are the head, with its loop or leader, and the loose shaft, with its runner or grommet of rawhide passing over and inclosing the leader of the head.

The body is of bone or ivory in the form of a flattened cone. The spur is beveled and curved up at the point. Two delicate barbs are parallel on the outside and divided by a furrow along the back. Blade of iron, triangular, with convex edges, inserted in the blade slit and riveted. Plane of the blade parallel with the line hole. Shaft socket in the spur narrow and deep. Line hole transversely through the body. Line grooves extended to the end of the barbs and ornamented with engraved lines. Leader of rawhide, neatly spliced by seizing at the ends, and the space between lashed with double hitches passing between the rawhide ends. A narrow seizing holds the two elements close to the toggle head. It may be questioned whether the peculiar curves of back and belly give the head a start in toggling itself in the wound.

Foreshaft of bone, spindle-shaped, and attached to the loop of the toggle head by a small running loop or grommet of rawhide.

Length, $3\frac{1}{8}$ inches. Eskimo of Sfagamute, north of Bristol Bay. Cat. No. 37955, U. S. National Museum. Collected by E. W. Nelson.

The illustration in Plate 10 shows the construction of the larger Bering Sea harpoons (Cat. Nos. 43346 and 153727), cast from the hand, and used in killing large seals, walrus, and white whales. They have stout wooden shafts, from 4 to 7 feet long, with a hand rest near the center made of bone or ivory, neatly fitted on and held in place by a lashing of baleen, rawhide, or sinew cord. The foreshaft is of bone and ivory, neatly fashioned, fitted to the end of the shaft by a tenon and socket, and held firmly by a seizing of baleen. The foreshaft is pierced near its base for the line which holds all the parts together, and has a socket on top for the loose shaft.

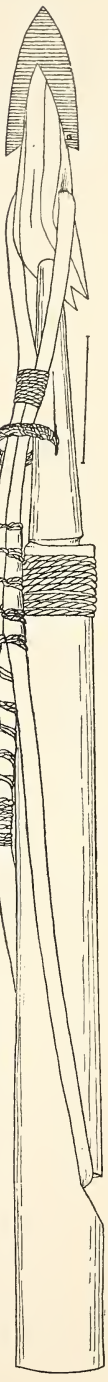


Fig. 84.

TOGGLE HEAD AND ACCESSORIES.

Kuskokwim River.

Collected by E. W. Nelson. Cat. No. 37395, U.S.N.M.

At the butt end of

the shaft is a bone pick, attached by a wedge-shaped joint, the bone fitting into a kerf in the wood. The upper part of the pick is bored through for the assembling line. Around the joint is a lashing of baleen, neatly laid on, the assembling line being neatly interlaced with the wrapping. Especial attention is called to the fastening off and the knots on the shaft. The foreshafts of the large Bering Sea harpoons belong to the two quite distinct forms, the spindle-shaped and the conoidal. On the left side of Plate 10 is shown the form and mounting of a spindle-shaped loose shaft, and on the right side that of a conoidal form. In this example the projection is on the loose shaft and the socket in the foreshaft. In both forms a hole has been bored through the loose shaft for the assembling line. In these harpoons the heads belong to Murdoch's later type; that is, the blade and line hole are in the same plane, at right angles to the longest diameter of the cross section of the toggle head. The blades of these harpoons are of slate, iron, brass, and, in a few specimens, of jade-like material. The toggle head is attached to the main line by means of what Murdoch calls the leader, which is a stout rawhide thong, 1 to 2 feet long, passed through the line hole, the two ends being overlapped and seized together; near the head a few turns of fine thong or sinew twine hold the two sides of the loop together, forming a becket. At the other end the leader is spliced into a becket on the end of the line. The line, when the head is ready for action is "done up" on the shaft, the far end being securely tied. When the game is struck, the head is withdrawn, the loose shaft unstripped, the line unrolls, and the shaft acts as a drag.

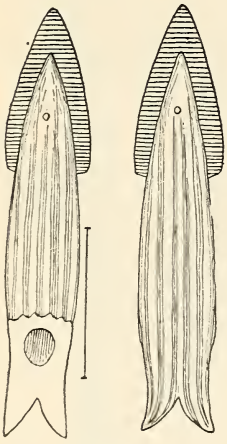
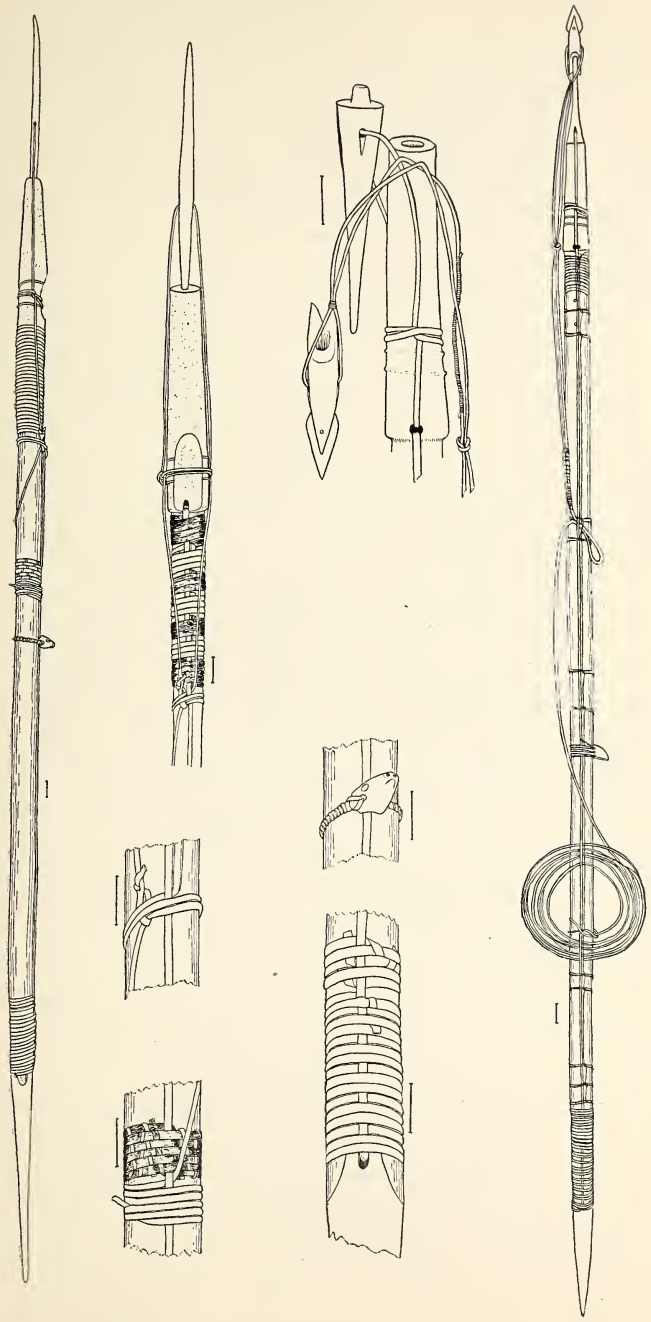


Fig. 85.
TOGGLE HEAD.
Cape Nome, Alaska.
Collected by E. W. Nelson. Cat. No. 44484, U.S.N.M.

An artistic little toggle head of bone and iron from Cape Nome (Cat. No. 44484, U.S.N.M.), on the northern shore of Norton Sound, is shown in fig. 85. Body is somewhat pyramidal, the upper and lower surface being elegantly fluted and ridged. The blade is deltoid, with square butt and slightly convex margins, set deeply into the tapering point of the body in the plane of the line hole and fastened with a bone rivet. The line hole passes straight through the body of the toggle head, the ends being flanked by triangular line grooves. Barbs, two cocked up and flared outward and bounded by the ornamental ridges, which closely follow the outlines of the back and terminate gracefully in the tips of the barbs. Butt end a curved plane, upright below and tapering above.

A cast-iron toggle head (Cat. No. 44747, U.S.N.M.), from Sledge Island, Alaska, just south of Bering Strait, all in one piece—exactly



LARGER BERING SEA HARPOON.

Collected by E. W. Nelson.

Cat. Nos. 43346 and 153727, U.S.N.M.

similar to the little seal harpoon heads of ivory—blade of iron, and bifurcated barbs, is shown in fig. 86.

Collected by E. W. Nelson. This is the last word in the inventional history of the toggle harpoon head. From this point it enters the world-embracing commerce, being cast in metal and sold to island peoples all about the Pacific Ocean. It has no voice in settling the question how far similarities in aboriginal arts argue for contact or sameness of mind and its environments.

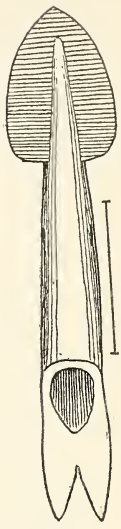


Fig. 86.
IRON TOGGLE HEAD.
Sledge Island.
Collected by E. W. Nelson. Cat. No. 44747. U.S.N.M

Specimens Nos. 45429 and 45430, in the U. S. National Museum, are barbed harpoons from Cape Nome, the northwestern corner of Norton Sound, Alaska. These are similar to the Sledge Island specimens without feathers, one of them having the assembling line of sinew thread and the other of rawhide.

The measurements of No. 45429 are: Shaft, 45½ inches; foreshaft, 4 inches; point, 3 inches. Measurements of No. 45430 are: Shaft, 46 inches; foreshaft, 4 inches; point, 2¾ inches.

A bone toggle head (Cat. No. 46154, U.S.N.M.) of medium size, from Port Clarence, just south of Bering Strait, Alaska, is shown in fig. 87. Body conoidal in form, elliptical in section, and higher than broad. Blade of iron, deltoid in form, set deeply in the slit and riveted with bone or wood. Line hole straight through, wider behind and run out into well-defined line grooves. Barbs two, formed by the bifurcation of the back, being angular, cocked up, and flared out. Socket for the foreshaft shallow and having a sharp edge on the butt, which is a single curved surface, nearly perpendicular below, quite elongated above the socket. Length, 3½ inches. Collected by Dr. T. H. Bean. Of similar character to No. 46154 are many other pieces in the Museum. In fact, when the shape arrives at a certain stage beyond the inventor, it seems to turn into the highroad of mechanical monotonies.

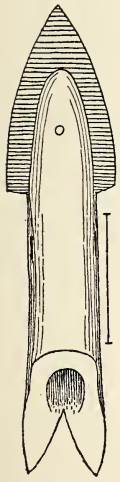


Fig. 87.
TOGGLE HEAD.
Port Clarence, Alaska.
Collected by T. H. Bean. Cat. No. 46154, U.S.N.M.

Plate 11, Catalogue No. 48156 in the U. S. National Museum, is a barbed seal harpoon projected from a throwing stick, from Sledge Island, on the northwestern shore of Norton Sound, collected by E. W. Nelson. The shaft is of light pine wood, tapering gently from tip to butt and slightly flattened in cross section. The tip end is socketed for the reception of the tang of the foreshaft. The peculiarity of four specimens from this locality is that the socket is split very little on the

outside, to allow for shrinkage in hafting. The foreshaft, as in most other specimens, is of whale's bone and cylindrical. The shank for fastening to the shaft is shouldered and notched for the attachment of the assembling line. No feathers; but on another specimen, No. 48153, three half feathers, with plume inside, attached to their ends, as in example No. 129585, from Cape Blossom. The point is of bone, flat on one side and rounded on the other. Barbs, three on one margin and two on the other. The shank of the point is flat. The line is of dark seal rawhide, attached by one end through the line hole of the point by means of two double splices an inch apart. It is split near the middle, the two ends being fastened to the shaft about 18 inches apart by means of a clove hitch.

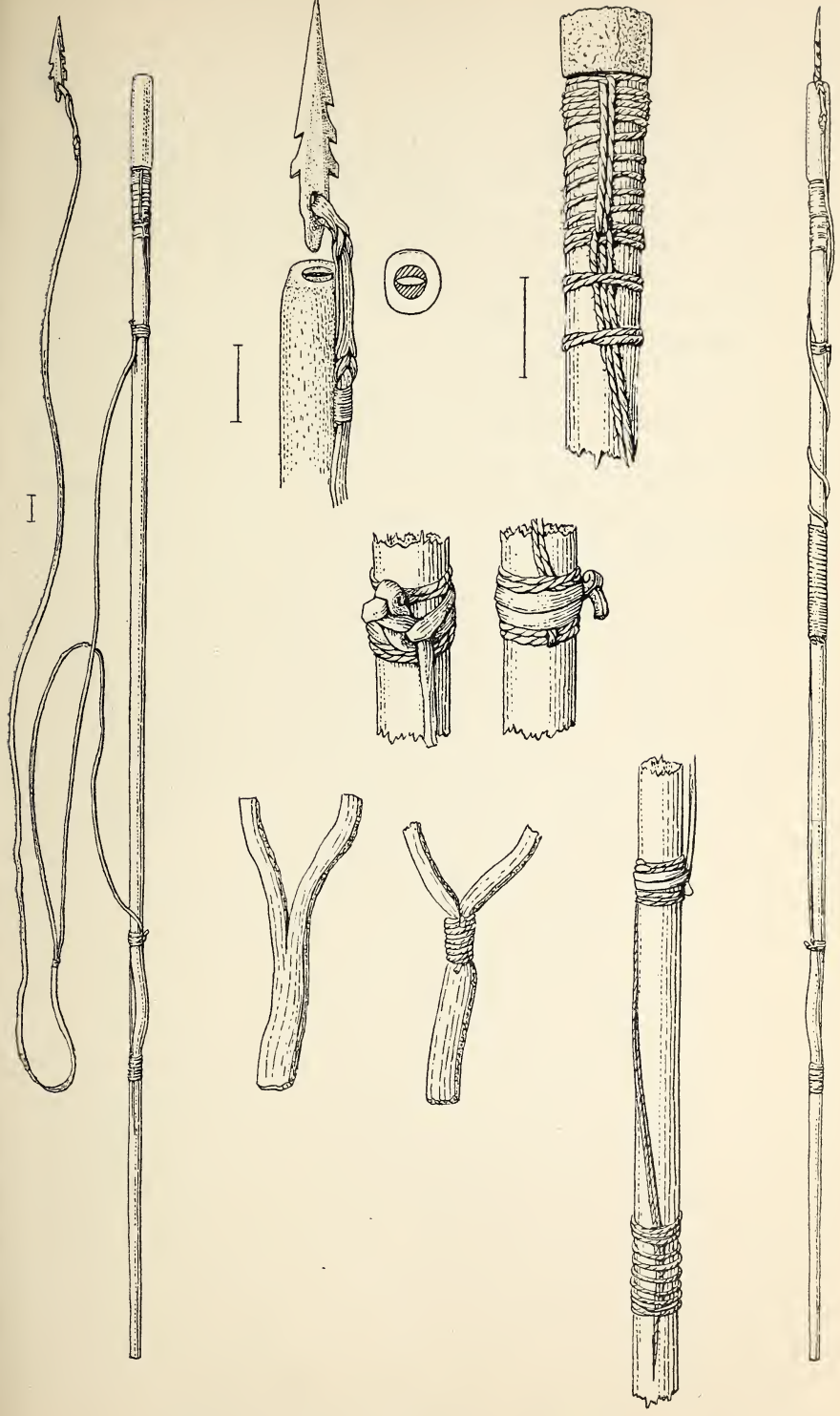
The front assembling line is looped around the shank of the foreshaft by a clove hitch wrapped around the end of the shaft to prevent slipping, and is continued to the upper attachment of the martingale. Between its two knots the martingale acts as an assembling line. From the hindmost knot of the martingale an assembling line of sinew thread proceeds backward for 4 inches, where a dozen turns are made and the end is punched into the wood near the end of the shaft. Between the two knots of the martingale the shaft has been mended by a series of half hitches and clove hitches made in sinew thread.

In specimen No. 48154, from the same locality, the upper assembling line is in fine seal rawhide. Length of shaft, 46 inches; foreshaft, 4 inches; point, 3 inches.

Specimen No. 48365 in the U. S. National Museum is a barbed harpoon for throwing stick, from Nunivak Island, south of Yukon mouth. The shaft is of soft wood, nearly uniform in thickness throughout, truncated and wedge-shaped at the upper extremity to fit into a corresponding cut in the foreshaft. Especial attention might be called to the expansion of the small end of the wedge to correspond with depressions in the shouldering on the parts of the foreshaft which overlap the wedge, in order to prevent the joint from coming apart. This is a step toward a dovetail.

The foreshaft is of walrus ivory, slightly expanded in front and conoid on the top. The tang has a wedge-shaped saw cut to fit on the end of the shaft. The two flanges are shouldered where they join the body of the foreshaft, and have notches cut on them at the outer extremity for the lashing. This is driven on the end of the shaft and the two are seized together by means of sinew braid laid on neatly. A small plug of wood is inserted in the outer end of the foreshaft, having a conical socket for the butt end of the barb.

At the base of the shaft there are two sets of black feathers, one above the other. Each feather is whole, its inner end seized to the shaft by means of the assembling line, which is wrapped several times



BARBED HARPOON FOR THROWING STICK, SLEDGE ISLAND.
Collected by E. W. Nelson.
Cat. No. 48156, U.S.N.M.

around. The top ends of the feathers are firmly driven into holes in the wood.

The head is of ivory, flat on one face and angular on the other. The shank is nearly conical, fitting into the socket of the foreshaft. Line hole elongated. Barbs, three on one margin and two on the other.

The line or martingale of the harpoon is of rawhide; the undivided end is passed through the line hole of the head and tied in a bowline knot. The two ends of the martingale are attached to the shaft near the feather and near the foreshaft by clove hitches. The sinew braid by means of which the shaft and foreshaft are seized together is continued on toward the feathers, with here and there a half hitch, until it reaches the rear feathers, where it forms the seizing, and then passes backward to become the seizing of the front set of feathers, and it is fastened on by being punched into the wood in a similar way to the top end of the feathers.

Among the Eskimo tools there is a little ivory point belonging to the outfit of the bow-and-arrow maker, used especially for making holes in soft wood, into which the ends of feathers and lines are punched to form a smooth fastening. It seems to be very effective. Length of shaft, 3 feet 7 inches; length of foreshaft and shank, $7\frac{3}{4}$ inches; length of point, 3 inches. Collected by E. W. Nelson.

A sea-otter harpoon dart Pishudak, (Cat. No. 72415, U.S.N.M.), from Bristol Bay, Alaska, is shown in Plate 12. In its composition it resembles a large number of specimens used in an important industry. It will be described, therefore, in detail. The head is of ivory, flat on one side and angular in section on the other. There are three barbs, two on the left margin, one on the right; the line hole is oblong. The tang fitting into a socket at the end of the foreshaft is a little cone, shouldered above. The line is of braided sinew, fastened into the line hole of the barbed head by a bend and knot. The other end in this and kindred specimens has not the martingale, but is tied to the shaft near the middle of the bladder. When the animal is struck, the barbed head pulls out from the foreshaft, the line unrolls from the shaft, the bone head drops, and the bladder rises. The apparatus acts then both as a drag and a signal. The foreshaft, of bone, is bill-shaped, cut off square at the base, excepting a slight tenon in form of a cylinder to fit into a socket at the front end of the shaft. In the front end of the foreshaft a cylinder of pine wood is set, and this must be noted on all barbed harpoons. The purpose is to give the tang of the head a firmer hold when the weapon is ready for action. The shaft of this and other like specimens is of wood, tapering just slightly from front to rear. The socket for the tenon of the foreshaft is carefully bored, and wrapped with sinew braid. The same braid is continued down the shaft for assembling line, and serves also for attaching the float, which in all small harpoons of this class is made from

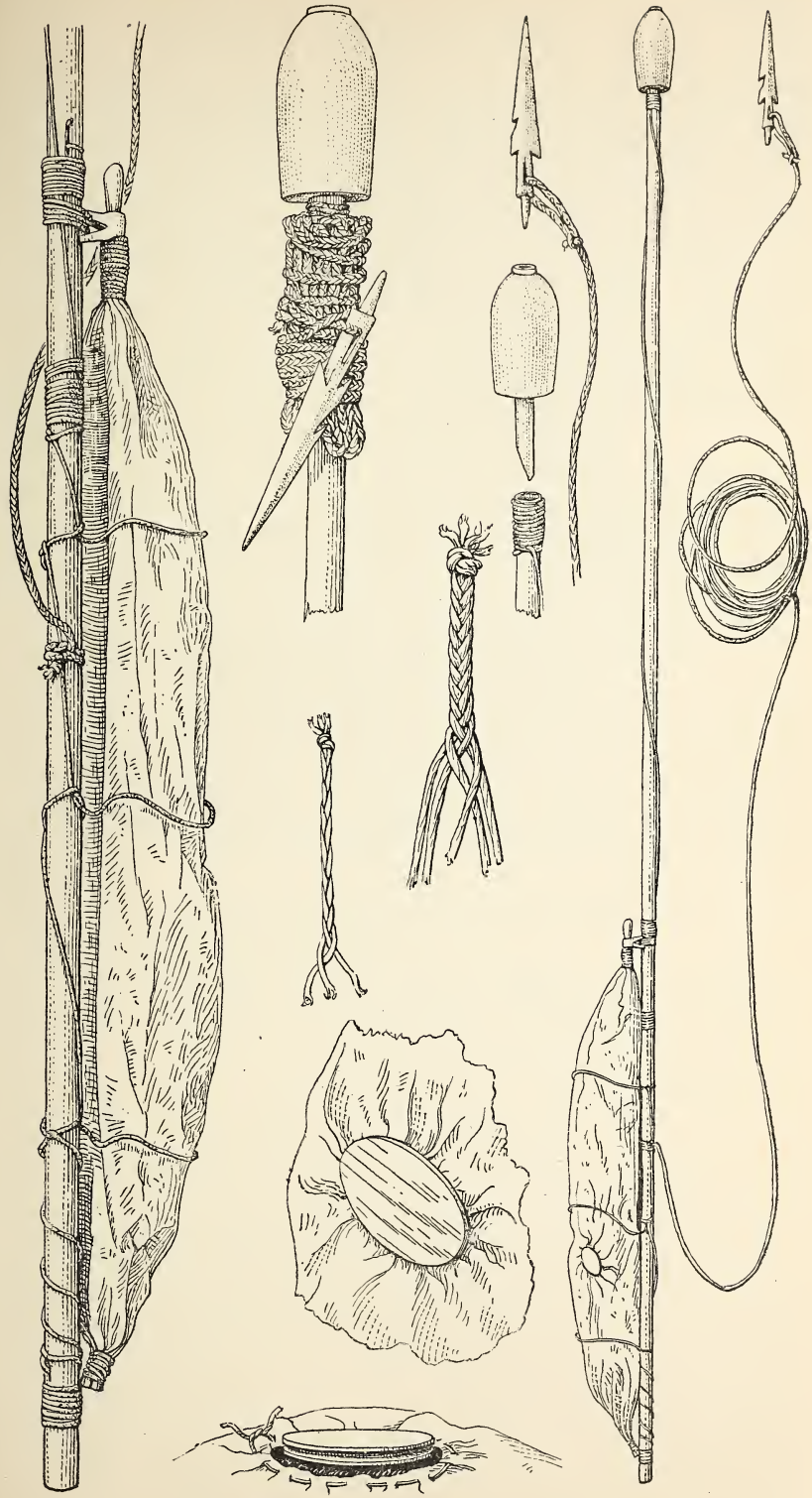
bladders, stomachs, or intestines of seal or walrus. They are cleaned out, one end fastened up securely, and into the other a mouthpiece with plug is set for purpose of inflation. The subject is discussed by Nelson.[1] In the example shown the process of inserting a stud or plug into the float where it has been pierced is illustrated. Length of shaft, 44 inches; length of foreshaft, 2½ inches; length of barb, 4½ inches. Specimen No. 11356 is quite similar. Length of shaft, 46¼ inches; length of foreshaft, 3 inches.

Examples No. 8004 to 8007 in the U. S. National Museum are feathered harpoon darts from Bristol Bay. The shaft is very little expanded in front and slightly expanded at the nock. There are three half feathers neatly trimmed and bound on in front by the assembling line which is also used to seize the foreshaft, wrapped around the shaft and ends at the feathers. The feathers are seized at the nock with a strip of split quill and are further held in place by a thread which holds the midrib of the feather to the shaft of the dart at five places. The feather seizing at the nock is noticeable in all of these specimens and separates them from the others in the collection.

The foreshaft, of ivory, is conical, smaller at the butt end, where it is inserted into the shaft by means of a shoulder plug which is driven into the socket at the end of the shaft. The front end of the foreshaft is abruptly conical and finished off with a wooden plug which has a pit or socket for the barbed point. The point is of bone and has two barbs on one side and one on the other. Length of shaft, 44¼ inches; of foreshaft, 5½ inches; of point, 3 inches. Collected by Dr. T. T. Minor. Similar to these are Nos. 19378 and 19380, collected by the Rev. James Curley, having in all respects the same characteristics, excepting that the seizing at the nock is not of quill, but a continuation of the thread which holds the shaft of the feather to the shaft of the spear.

Plate 13 (Cat. No. 90416, U.S.N.M.) is a sea-otter spear from Ugashik, Bristol Bay, Alaska. The shaft is of wood, tapering from the fore end to the rear end. The head is of bone and has two barbs on one margin and one on the other. The line hole is small and has no line grooves. The tang is whittled off thin to fit into a delicate socket on the end of the shaft. The leader or loop on the barbed head is a narrow strip of sealskin doubled through the line hole and seized together. The ends are also united in such a way that the loop is closed in the middle. At the other end the thong is doubled, passed through an eyelet, over the projecting point to form a "detacher." On the shaft at five places are bands of birch bark and around these are wrapped sinew twine in half hitches for the purpose of retrieving the parts of the shaft if it should be broken. The bladder is a portion of the intestine of a seal, having

[1] The Eskimo about Bering Strait, 1899, pp. 40 to 145.



SEA OTTER HARPOON, BRISTOL BAY, ALASKA.
Collected by C. L. McKay.
Cat. No. 72415, U.S.N.M.

a delicate mouthpiece of ivory, neatly set on to the side of the shaft by wrappings of sinew thread passed through two holes bored in its upper portion. The other end of the bladder is bound to the rawhide thong, which is secured by being pushed under the wrapping of sinew thread between it and the birch-bark packing. The line is of rawhide and is securely fastened to the "detacher" at one end by a bend, which is held in place by a figure-of-8 wrapping of sinew thread. The rest of the line is wound about the shaft when the spear is ready for action, the other end being attached to the shaft between the two ends of the bladder. When the animal is struck, the head unships, the line unrolls, the head of the shaft drops into the water and the whole acts as a drag and a signal to show the position of the game.

Examples Nos. 90417 to 90419 in the U. S. National Museum are feathered sea-otter harpoon darts from Ugashik, north of the Alaskan peninsula. The shaft is of light pine wood, very nearly cylindrical, and tapering slightly toward the front. The foreshaft is of bone and has a plug on the inner or butt end which fits into a socket on the end of the shaft, and the joint is seized by a fine sinew or intestine braid, the inner end of which is continued backward with half hitches for an assembling line. Near the feather a band of this braid an inch in width is formed, and 4 inches above the feather is another one around the inner end to the feathers. There are three feathers, seized in front by the assembling line, and at the nock by a separate wrapping of braid. They are split and further held down by a light thread, which binds the shaft of them to the shaft of the dart in five places by half hitches.

This method of attaching the feathers is found in Nos. 8004 to 8006 and seems to be typical of the region.

The line or martingale is attached to the shaft 4 inches behind the foreshaft and 4 inches in front of the feather. The point is small and has three barbs on one side, and is attached to the line by means of a hole bored in the shank and fitted into the foreshaft by a tang which is nearly cylindrical. Length of shaft, 4 feet; of foreshaft, $5\frac{1}{2}$ inches; of point, $1\frac{3}{4}$ inches. Collected by William J. Fisher.

The darts are called Nagik kujat; the bone foreshaft, Mamkuk; the line, Punak; the bone head, Kugichalugak; the feathers, Nakchute.

A complete toggle harpoon (Cat. No. 160337, U.S.N.M.), with line float and line board, from Kusilvak, at the mouth of the Yukon River, in Alaska, is shown in Plates 14 to 15. The toggle head shown in Plate 15 is of ivory, a delicate object, perfect in all its details. In outline it resembles the head of a duck. The blade is set into the saw-cut at the point of the body, and in the plane of the line hole, which is bored straight through from margin to margin. The barb is cut into three points, which form a part of the ornamentation. Through the line hole passes a long loop, which is neatly spliced at its ends and wrapped

and knotted so as to keep it in shape. At its other extremity it unites with the end of a long rawhide line, which in turn is looped at its other end to a becket or loop of sealskin float, and frequently an additional line is spliced between the two. This line rests upon a flat board frame, which is thus described.[1]

The float board consists of a strong, oval hoop of spruce made in two U-shaped pieces, with the ends brought together and beveled to form a neatly-fitting joint, which is wrapped firmly with a lashing of spruce root; the sides have holes by which a thin board is fastened to the under side, the ends of which are notched in front to form a coarsely serrated pattern with five points that are inserted in slots cut in the front of the hoop. The front of the board is oval, and the sides taper gradually to the points of two projecting arms, which extend 4 or 5 inches below the bow; between these arms a deep slot is cut, with the inner border rounded. The board has a round hole in the center and a crescentic hole on each side (Plate LIV, fig. 10).

On the kaiak the float board is placed in front of the hunter with the arm-like points thrust beneath the cross lashing to hold it in position, and upon it lies the coil of float line with the spear attached and resting on the spear guards on the right rail of the boat; the end of the line is passed back under the hunter's right arm to the float, which, fully inflated, rests on the deck just back of the manhole.

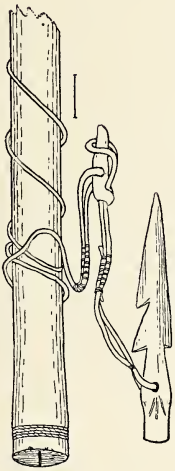
When the spear is thrown, the coil runs off rapidly and the float is thrown overboard. In some cases, when the prey is vigorous and leads a long pursuit, another line, like that shown in figure 9, Plate LIV, is made fast through the semilunar orifices in the center of the float board, which latter, when drawn through the water by means of this cord, assumes a position nearly at a right angle to the course of the animal and forms a heavy drag to impede its progress.

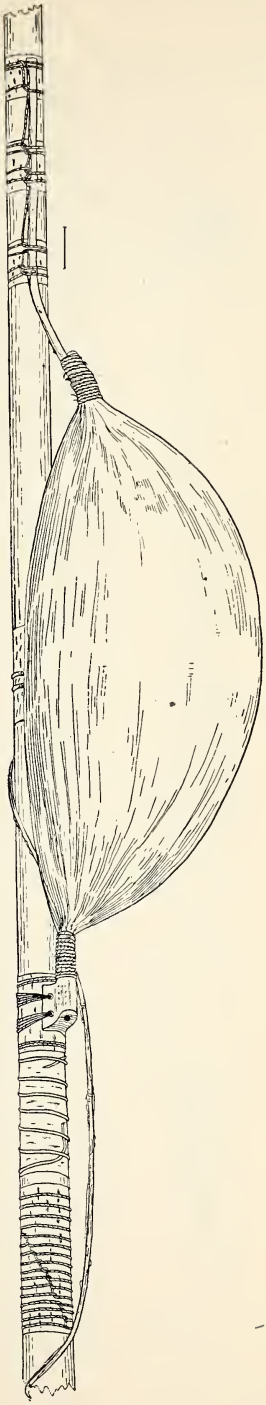
When hunting on the ice, the float board, with the line coiled upon it, is carried in the left hand of the hunter and the spear in the right hand while he watches along the borders of the leads or holes for the appearance of the seals. When he succeeds in striking one, he holds firmly to the line until the animal is exhausted, or, if necessary, the float board attached to the line is cast into the water, while the hunter hurries to his kaiak and embarks in pursuit.

In plate 15 will be shown the method of uniting the toggle head with the loose shaft, this with the fore shaft, and the fore shaft with the shaft. This last joint is worthy of study, with its curious tenon and shoulder fitting into a socket at the end of the shaft. Especial attention is called to the manner in which the shaft is cut away a short distance on the outside to allow the lashing of sinew to draw the joint perfectly tight. Attention is also called to the method of fitting the splicing, at which the Eskimo are quite adept. On the surface of the fore shaft the dot and ring ornaments occur. This decoration, wherever found, is an emblem of the existence of steel tools. Very little ornament exists on the old Eskimo weapons found in localities away from contact.

The head of a toggle harpoon (Cat. No. 168625, U.S.N.M) from Bristol Bay, collected by William J. Fisher, is shown in fig. 88. The head is of bone, back sharp edged, front rounded, and the whole a flattened wedge shape at right angles to the line hole. The blade, of slate, is triangular, with convex sides, and glued into a saw cut in the end of the head. This socket for the loose shaft is square in section and shallow. The butt end of the body is beveled as in most harpoons of this class, but in such manner as to form an offset on the margin of the socket, and

[1] Nelson, The Eskimo about Bering Strait, 1899, p. 138.





LONG-HANDLED BARBED HARPOON, BRISTOL BAY, ALASKA.

Collected by William J. Fischer.

Cat. No. 90416, U.S.N.M.

the single barb is formed by the meeting of the sharp back with the two edges of this bevel. The line hole passes straight through the body and is flanked by shallow wide grooves. The loose shaft is a piece of pine wood flattened and wedge-shaped at its butt end to fit into a wide socket at the end of the foreshaft, shouldered about 2 inches from this end and then tapering to the point of juncture with the body of the toggle head. The loose shaft passes into the shallow socket of the head, where it is hinged. A rawhide thong is passed through the line hole and tightly seized on either side of the loose shaft 3 inches below its outer end. This forms a hinge, so that when the body of the toggle head is drawn down the point of the loose shaft comes out of the socket, and the parts are held together by the wrapping or seizing. The two are further secured together by a grommet of spruce root. When in rest the wedge-shaped butt end of the loose shaft passes between the two sides of the rawhide line, and in unhinging from the toggle head this part also flies out in an opposite direction. At the end of the rawhide line is a loop for the attachment of a longer line.

This old example is very interesting indeed, forming a connecting link between the Eskimo toggle head and the forms allied to it among the Indian tribes farther south. Length of head and blade, 6½ inches; loose shaft, 9¼ inches.

Plates 16 and 17 (Cat. Nos. 16407, 19382, and 72412, U.S.N.M.) show the forms of harpoon arrows in use on the north and the south side of the Alaskan peninsula. The last mentioned, No. 6 on the plate, from Bristol Bay, is farthest removed from the arrow and nearest the harpoon with its club-shaped head and bilateral barbs. The line hole in the barbed head, the line running from head to shaft, the socket for the head, the joint between head and shaft, are all suggestive of the small seal harpoon. No. 5 on the plate, from Cook Inlet, in its head approaches very near to the simplicity of the Fuegian barbed harpoon. The half feathers set on radially are more Indian than Eskimo. Fig. 4 on Plate 16 is the delicate sea-otter arrow from Kadiak, the paragon of aboriginal projectiles. The specimen is fully illustrated on Plate 17.

This is the most elaborate and ingenious arrow known, and all of its parts, in every specimen, are most delicately finished. Such a weapon may well have been used in hunting the most costly of fur-bearing animals—the otter.

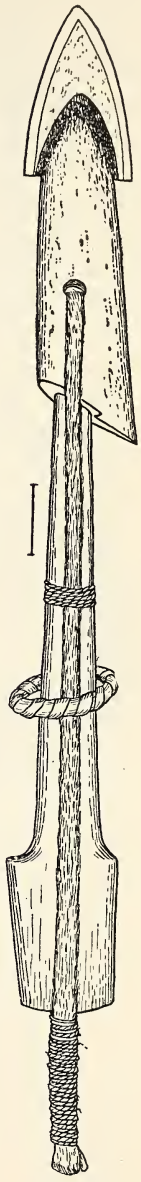


Fig. 88.
TOGGLE HARPOON HEAD.
Bristol Bay.
Collected by Wm. J. Fisher. Cat. No. 168625, U.S.N.M.

The shaft is of spruce, gently tapering toward the neck, which is large and bell shaped. Into the end of the shaft is inserted a foreshaft of bone, and into the end of this fits the barb. Feathers, three, symmetrically trimmed and seized at both ends with delicately twisted sinew thread. The barbed head is perforated, and through these perforations is attached a braided line at least 10 feet long. The other end of the shaft is secured to two points on the shaft by a martingale. When not in use the line is coiled neatly on the shaft and the barb is put in place in the foreshaft. When the arrow is shot, the barb enters the flesh of the otter, the loose fastening is undone, the line unrolled, the foreshaft drops into the water; the shaft acts as a drag and the feathers as a buoy to aid the hunter in tracing the animal. (See Plate LII, fig. 4.)

Fig. 1. Arrow with line unrolled, showing relation of parts.

Fig. 2. The shaftment. Attention is drawn to the delicate seizing with sinew thread, the natty trimming of the feather, the most efficient nock.

Fig. 3. The lines and knots. Notice is given of the elegance of the braid, the efficient manner of "doing up" the line, the peculiar knot for the martingale.

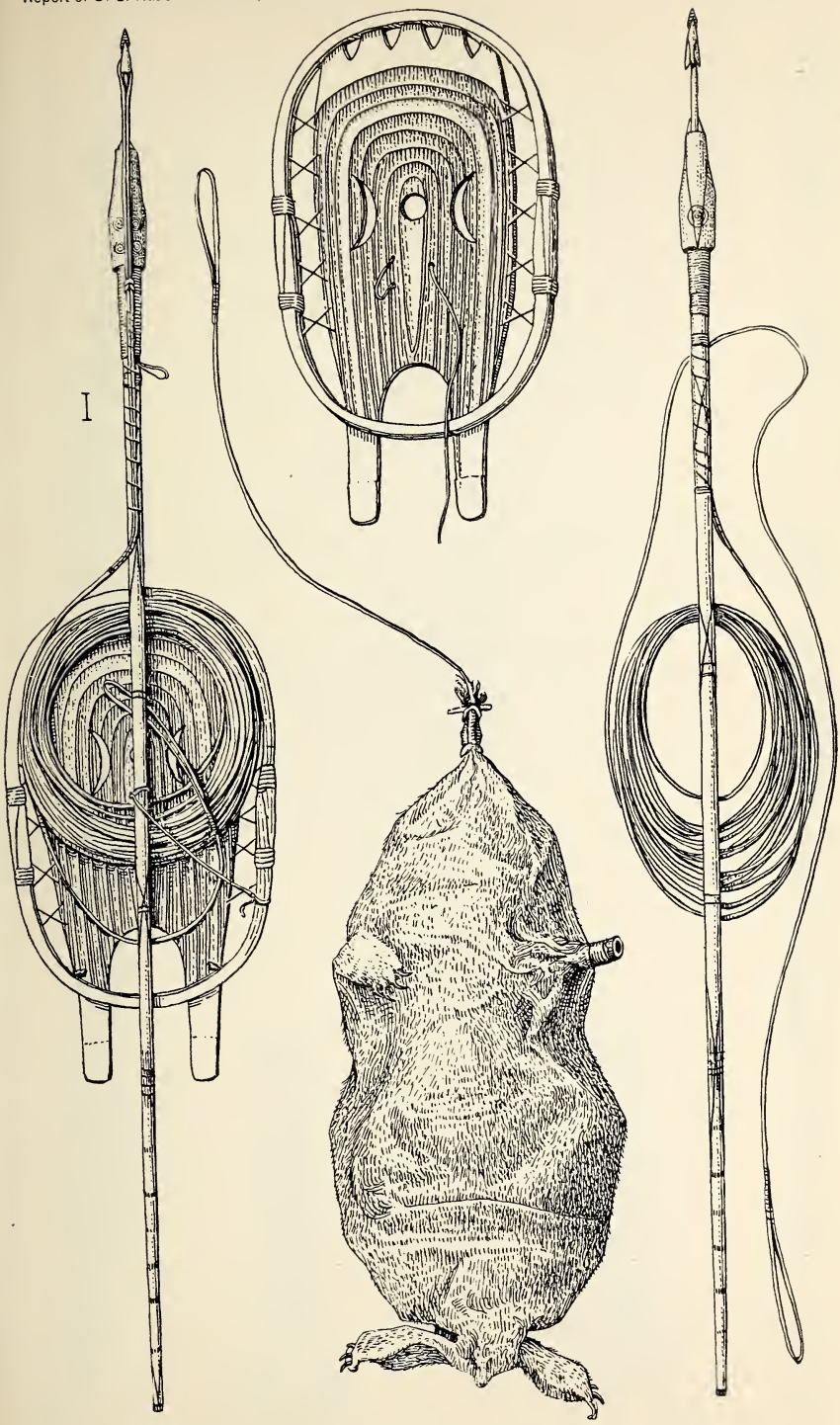
Fig. 4. The arrow ready to be shot.

This form of arrow, with its southern type of sinew-backed bow, is found also on the Kuriles, where they were taken by Aleuts, carried over by the Russians to hunt sea otter.

The arrows numbered 1, 2, and 3 in Plate 16 are from the same areas as the harpoon arrows just described, namely, from Bristol Bay to Kadiak. The heads are essentially those of harpoons, and are set into the ends of the shafts in the loosest manner by a slight conical projection fitting into a socket. When the animal is struck the head withdraws itself and remains in the wound. A short piece of string between head and shaft would convert these three missiles into harpoon arrows. To make the likeness more complete, No. 3 has a wooden cap over the blade.

Cat. No. 72518 in the U. S. National Museum is a sea-otter harpoon dart or Pishudak from Chernoborn Island, Cook Inlet. The bladder, shaft, assembling line, foreshaft, martingale, and barb are similar to the others in all respects excepting the attachment of the foreshaft to the shaft. A projection from the butt of the ivory foreshaft forms a wedge which tapers in two directions. In fact, the foreshaft is dovetailed into the end of the shaft and seized with a sinew braid or sennit, which acts as the assembling line. See Plate 16 for details of Cat. No. 19382, a harpoon arrow from the same locality. Length of shaft, 45½ inches; of foreshaft, 3 inches; of point, 5 inches. Collected by William J. Fisher.

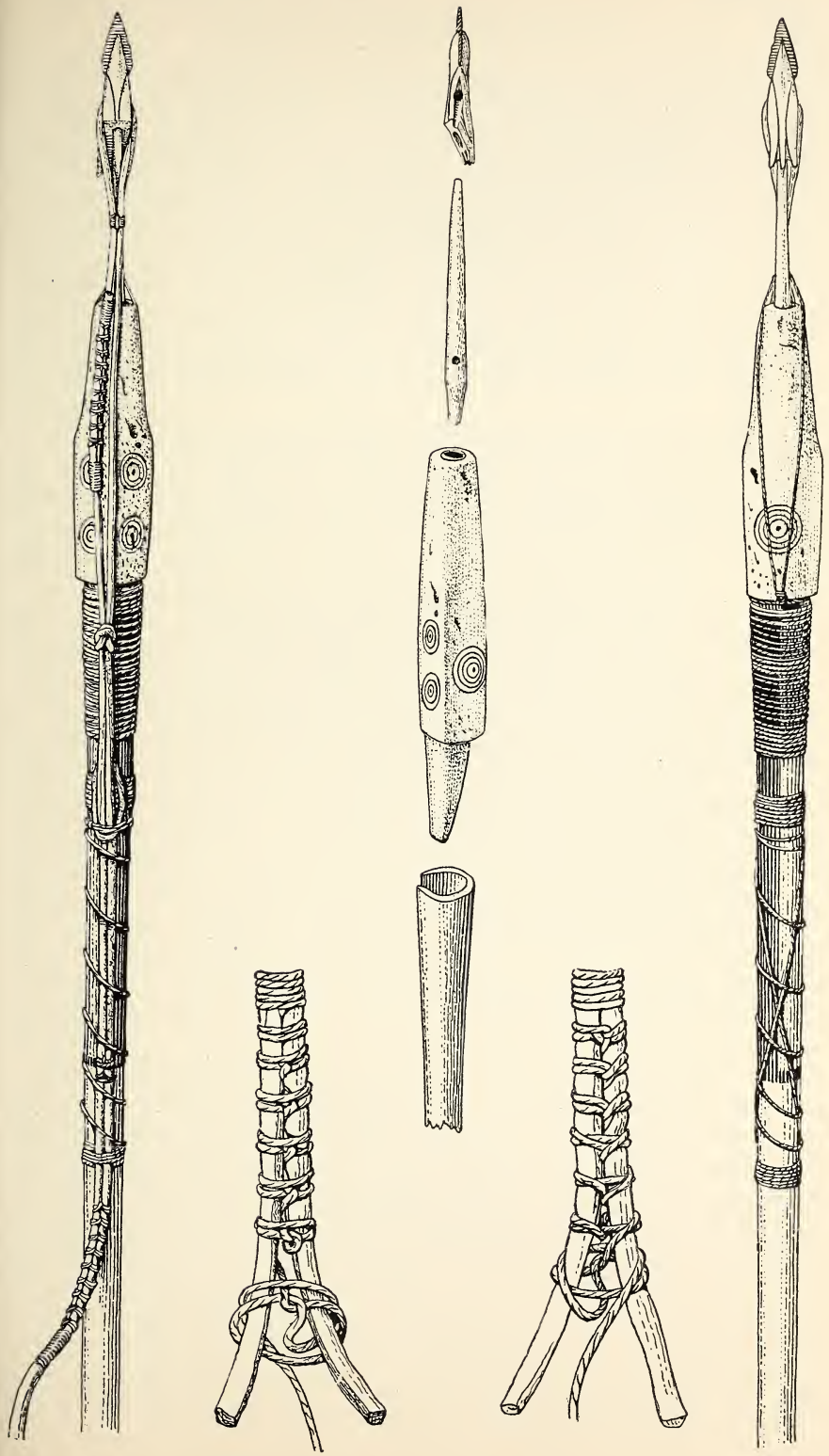
Plate 18, Cat. No. 175825 in the U. S. National Museum, is a sea-



TOGGLE HARPOON, LINE, AND FLOAT, KUSILVAK, YUKON RIVER.

Collected by E. W. Nelson.

Cat. No. 160337, U.S.N.M.



DETAIL OF KUSILVAK HARPOON IN PLATE 14.

otter dart from Unalaska. The shaft is of spruce wood; it is light and delicately made, not quite cylindrical, but becoming thicker toward the front. The foreshaft is of whale's bone, thicker where it joins the shaft, tapering smaller towards the front, and expanding at the tip end; flattened a little in cross section. A plug of wood is inserted in the socket at the tip end. The point of ivory has two barbs on one side and one on the other, and an extension or knob at the butt end, around which the line is fastened by a marlin hitch. The line is of sinew braid or sennit three-ply in the open parts, and six-ply between the martingale and the point. The martingale is tied, one end around the foreshaft and the other a little back of the middle of the shaft, by a clove hitch.

The shaft has in front a wedge with square front and shouldered in the rear. This wedge fits exactly into a slot in the butt end of the foreshaft. A small piece of birch bark is wrapped around the joint for packing and all the parts seized together very neatly with the finest sinew thread.

In this example, as in all others of its class, the shaft is painted red; on some of them the paint extends to the foreshaft. On a few examples bands of black paint are added at the butt end. Length of shaft, 42 inches; of foreshaft, 7½ inches; of point, 2¼ inches.

Feathers on the shaftment or butt end of the shaft, three, set on radially. The nock of this specimen is not unlike the foreshaft in form, only, in place of the notch to fit the bow string, there is a flat cone on the tip end with a small pit on the end to catch into the ivory hook on the foreshaft. By comparing this specimen with the harpoon arrows in Plates 16 and 17 the student has the best possible opportunity of seeing the close kinship between the harpoon and the arrow. It is entirely a matter of propulsion, whether from the hand, from a bow, or from an atlatl or throwing stick.

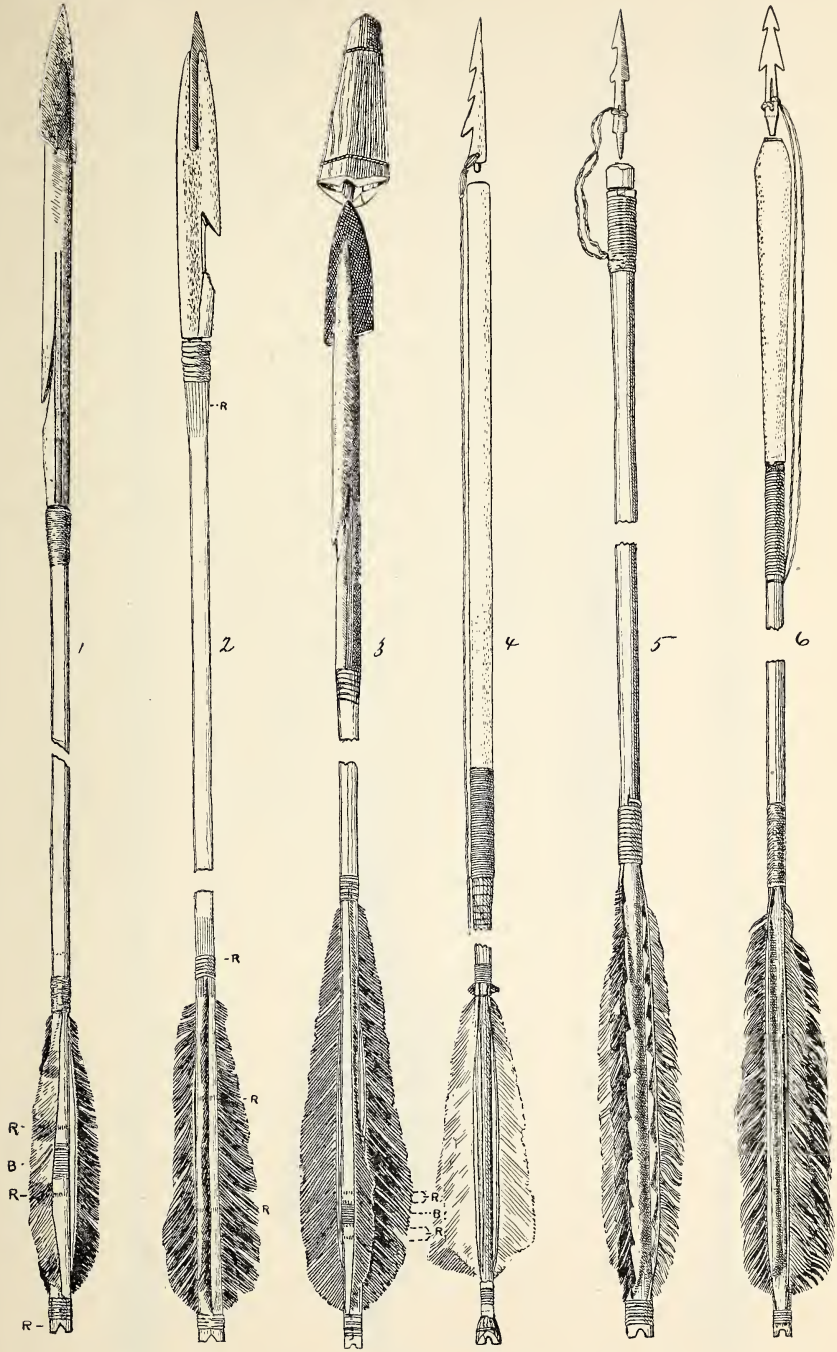
Plate 19 (Cat. No. 11362, U.S.N.M.) represents a barbed harpoon with bladder and hand rest. From Kadiak, and collected by Vincent Colyer.

The shaft is of pine wood, tapering gradually from the point to the butt. At the front end the shaft is widened out into a cylindrical form for about 2 inches and notched in like a spool. There is no foreshaft in this specimen. The socket for the point is lenticular in cross section and the spool-shaped space is filled with a wrapping of fine sinew braid. The shaft is ornamented with rings and longitudinal stripes in black, and the space between the two attachments of the martingale is painted solid black.

The point is of walrus ivory or hard bone, delicately made. There are two barbs on one side near the butt, which at a side view resemble the hoof of an animal. At the inner margin of one of these, three little dots and lines are added by way of ornament. On the

other side is a small barb or hook, which could scarcely be of any use. The tang is not tapered or shouldered, but is quite wide. The line hole is round, and into it is set a thong of rawhide, doubled and joined together at its ends and likewise near the barb by a lashing of sinew thread. Just above the point, where the two ends of the thong are bound together with sinew thread, a braided cord of sinew passes between the two ends of the thong and is made fast by a half hitch, a knot being tied in the end of the braid to prevent its coming undone. The braid constitutes the line of the harpoon. A few feet from the point, where the braid is attached to the rawhide leader of the barbed head, it is separated into two smaller braids, and these become the branches of the martingale, the ends of which are attached, one under the bridle, the other 3 feet from the front end of the shaft. The hand rest is a short piece of the black horn of the mountain goat. Its base fits on the shaft. Through a hole in this horn a lashing of sinew thread passes around the shaft several times. The bladder has at one end a delicate mouthpiece of ivory set against the shaft, held in place by sinew thread passing through perforations in the mouthpiece. At the other end the bladder is attached to the shaft by means of a rawhide thong tied a few inches away. At five different places on the shaft, namely, the two points of attachment for the martingale, the place of the hand rest, and the two points of attachment for the bladder, are bands of white birch bark, which serve both for ornament and as a soft packing to hold the different lashings in place. The manner in which the line is done up on the shaft when the harpoon is ready for action, by means of a loose knot, which is easily untied, is shown. In every respect this is a well-made and graceful implement. Length of shaft, 8 feet 5 inches; point, 8 inches.

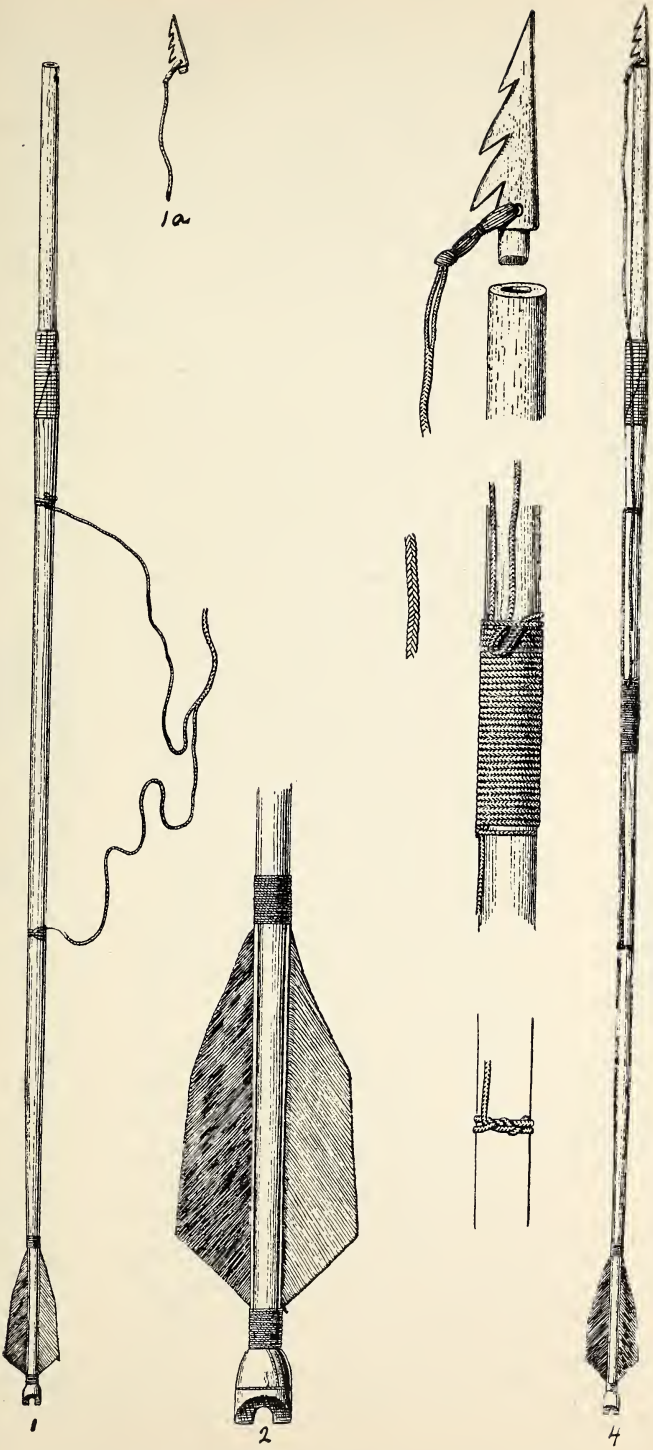
The Samoyed harpoon, on the testimony of Nordenskiold, consists of a large and strong iron head, very sharp on the outer edge and provided with a barb. The head is loosely fixed to the shaft, but securely fastened to the end of a slender line 10 fathoms long, generally made of walrus hide. The line is fastened at its other end to the boat, in the fore part of which it lies in a carefully arranged coil. There are from five to ten such harpoon lines in every hunting boat. When the hunters see a herd of walrus, either on a piece of drift ice or in the water, they endeavor, silently and against the wind, to approach sufficiently near to one of the animals to be able to harpoon it. If this succeeds, the walrus first dives and then endeavors to swim under water all he can. But he is fixed with the line to the boat and must draw it along. His comrades swim toward the boat, curious to ascertain the cause of the alarm. A new walrus is transfixed with another harpoon, and so it goes on until, one after another, all the harpoons are in use. The boat is now drawn forward at a whizzing speed, although the rowers hold back with the oars; but there is no actual danger so long as




BARBED SEA OTTER HARPOON ARROWS, ALASKAN PENINSULA.

Collected by W. H. Dall, James Curley, and Charles L. McKay.

Cat. Nos. 16407, 19382, 72412, U.S.N.M.




DETAIL OF SEA OTTER HARPOON ARROW ALASKAN PENINSULA.

all the animals draw in the same direction. If one of them seeks to take a different course from that of his comrades in misfortune his line must be cut off, otherwise the boat capsizes. When the walruses get exhausted by their exertions and by loss of blood, the hunters begin to haul in the lines. One animal after another is drawn to the stem of the boat, and there they commonly first get a blow on the head with the flat of a lance, and when they turn to guard against it a lance is thrust into the heart.[1] Whatever view one takes regarding the blood kinship between the peoples of northeastern Asia and those of North America, or between the languages of the two areas, the kinship of inventions is not to be denied. How far a device may travel or be transmitted without changing so much as one word in any language or one drop of blood is not known. A whale has been known to carry a harpoon head half way around the world and deliver it safely to a company of natives on the other side; and a throwing stick, with which harpoons are hurled, drifted from Bering Strait to western Greenland.

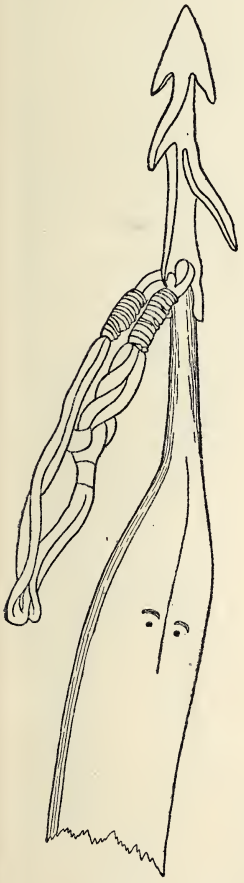


Fig. 90.
IRON TOGGLE HEAD.
Amur River.
After von Schrenk.

Fig. 89.
MODERN HARPOON HEAD OF IRON.
Cumberland Sound.
In Berlin Museum für Völkerkunde, after Franz Boas.

The harpoon has been briefly traced throughout the Western Hemisphere. It remains to notice one or two forms in which the sailor and the blacksmith have supplanted almost entirely the aboriginal mechanic. Boas figures an iron toggle head (1888, p. 473) now in the Berlin Museum of Ethnology. It is of iron, preserves the general shape of the native barbed and toggle head, the blade, spurs, and line hole being in parallel planes. The natives, according to Boas, also file these heads out of bits of iron. The end of the line is bent, run through the line hole, and fastened down by a compound splice (fig. 89). The fact has been already mentioned that toggle heads of bone were made wholesale

[1] A. E. Nordenskiold, Voyage of the Vega, I, 1881, p. 156.

in former times, and traded to the Eskimo for valuable furs. In the National Museum there is among the Nelson collection a small toggle head of cast iron all in one piece, fig. 86, the model of which was a native example of ivory and iron.

Fig. 90 is taken from Schrenk,[1] and shows the same invasion of iron into native arts. The object is a combined barbed and toggle head, in which, however, the barbs play the chief part. The leader, of rawhide, preserves its ancient bends and knots, and the eyes peeping from the foreshaft are certainly survivals of the ancient régime.

A harpoon (Cat. No. 19518, U.S.N.M.) from Cumberland Sound, collected by George Y. Nickerson, is shown in fig. 91. It is an interesting mixture of ancient forms with modern. The shaft is a well-turned, spindle-shaped piece of oak wood. The hand rest is an old ivory piece, turned ta right angles, set into the shaft for a short distance, and bound on with two seizings of sinew braid. Just below the hand rest is an iron loop through which the line runs. The foreshaft is a long bar of iron, set into the head of the shaft and packed, the joint being made fast by means of an iron ferrule. Near the inner end of the shaft is a padding of rawhide, connected a few inches away with the end of the shaft by a stiff rawhide sprig. The object of this ball is not known, but it may have acted as a buffer for catching the blow. The ice pick at the butt end of the shaft is also

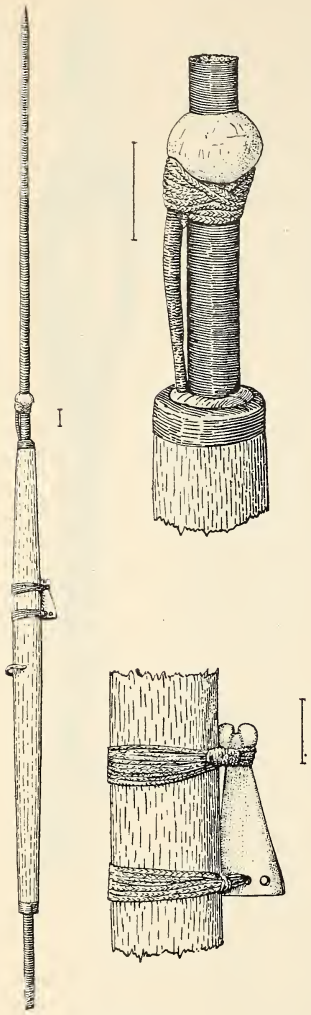


Fig. 91.

SHAFT OF TOGGLE HARPOON.

Cumberland Sound.

Collected by Geo. Y. Nickerson. Cat. No. 19518, U.S.N.M.

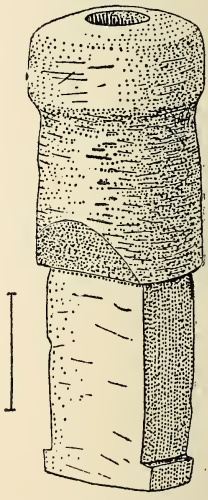


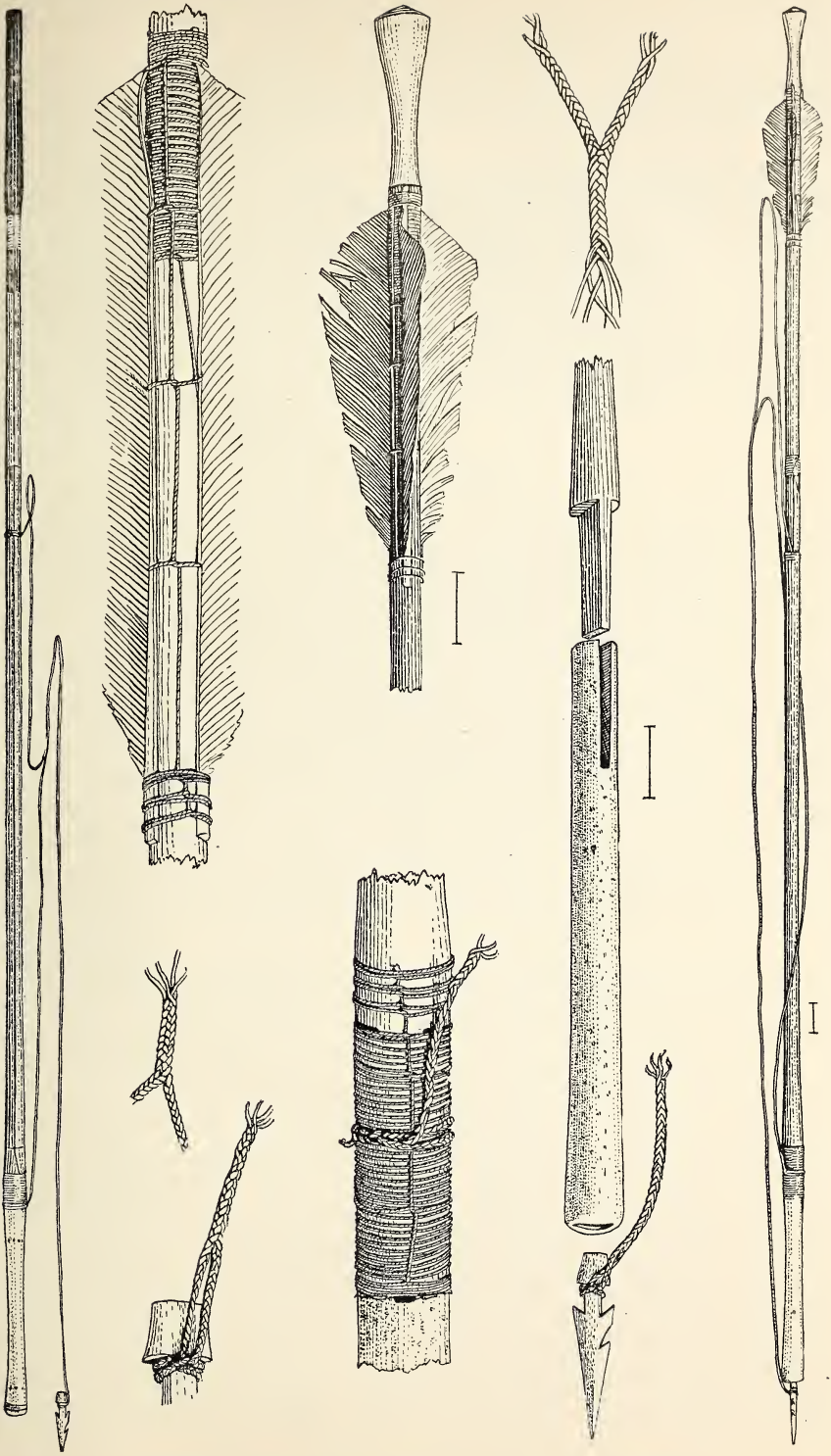
Fig. 92.

BONE FORESHAFT OF HARPOON.

Bristol Bay.

Collected by Charles McKay. Cat. No. 72403, U.S.N.M.

[1] Plate 42, fig. 2.



BARBED HARPOON DART FOR THROWING STICK, UNALASKA.
Collected by United States Fish Commission.
Cat. No. 175825, U.S.N.M.

of iron. It is impossible to conceive of a more excellent illustration of the fading out of an ancient primitive form and the gradual introduction of new elements.

The bone foreshaft (Cat. No. 72403, U.S.N.M.) of a large whaling or walrus harpoon from Bristol Bay is shown in fig. 92. It is the last expression in the use of modern tools for the preparation of a very ancient device. If this be compared with the gash in the end of the Fuegian harpoon, it will be seen that great progress has been made at this particular point. The upper part is carefully turned and the lower part cut with a tenon, so formed that when placed at the end of the shaft the strain in every direction is provided for. Collected by Charles L. M. McKay.

## CONCLUSION.

The harpoon is the most complicated of the devices invented by uncivilized peoples. In a hemisphere capable of awakening every kind of human wants and needs, furnishing an infinite variety of supplies to these from place to place, providing one sort of materials for the harpoon here and quite another sort there, inhabited by native tribes endowed with great range of genius, it would be expected that a universal weapon should take on every possible form. Just as the whale ship of yesterday, its friend and contemporary, has been replaced by the ship driven by steam, so the Eskimo at present kills the seal, the walrus, the whale, and the arctic land mammals with a rifle and explosive cartridges instead of the ancient harpoon. Should the Eskimo use his great weapon at all, it will be, as Murdoch shows, to retrieve his game on the edge of the ice after it is shot, and not as a killing device.

Both the ship and the harpoon served benevolent purposes, since they fostered and stimulated ingenuity until the fullness of time for steamships and firearms arrived. The harpoon is the climax of piercing inventions, which include daggers, lances, spears, javelins, and arrows of all kinds—held in the hand, hurled from the hand, either unaided or with the help of hand rest, amentum or atlatl, or shot from a bow. As was noted in the preceding drawings and descriptions, the harpoon had no limit in its application, being equally efficient on the land, in the air, in the water, or through the ice, at long range or short range, with short or long shaft, in some examples this part a hundred feet in length. The simplest forms have three rude parts; the most highly developed a score or more. Besides its own complexity, it has in the arctic area dominated the kaiak in its upper part, as well as the dress of the man, and called forth any number of accessories for decoying, finding, watching, taking out of the water, and carrying home.

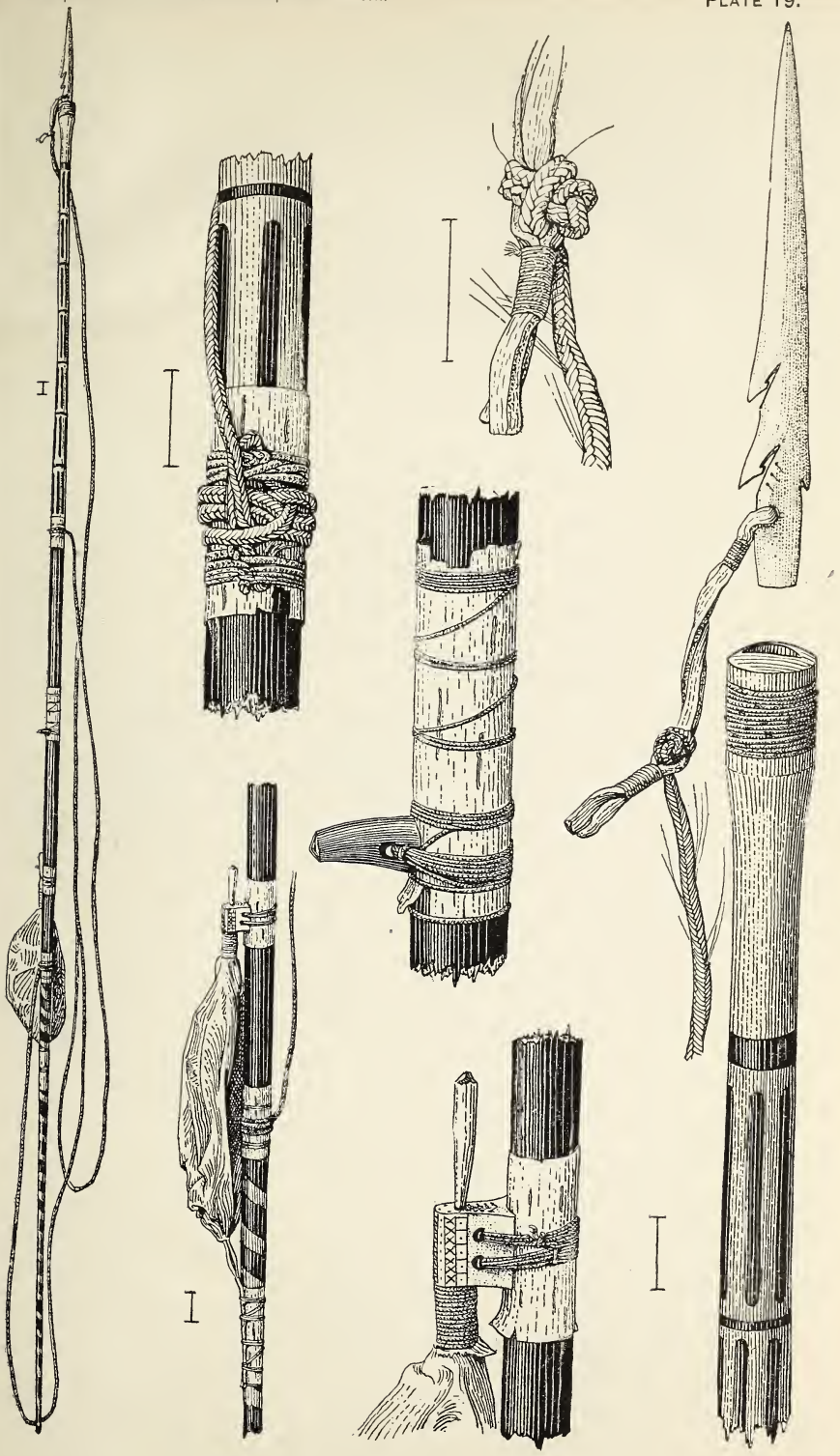
When it is remembered that every part of this complex apparatus

must be most efficacious for its region and quarry, and not bulky, one is not astonished to find a great variety of patterns in the structure and in the knots on the lines. The Eskimo themselves were not all agreed on these points. Hence, for example, Murdoch discusses the question whether the blade of the toggle head should be in the plane of the line hole or across it. Again, the length of the shaft and other characteristics were, in certain limits, fitted to the hunter. One has only to look through Nelson's plates to be convinced that there was a range of individual choice in many parts. While, therefore, it is correct to say that all harpoons of the different types resemble one another in the same area, it is equally proper to add that no two harpoons are alike.

Besides the lesson in the history of invention which this study affords, other questions arise. What help do these technical specimens offer to the ethnologist and the archæologist in deciding race, language, migrations, and antiquity? Can it be said of a harpoon, or some of its parts, found without label in a collection, that it was made by this or that tribe, or that it came from a certain area? Or, if in a shell heap or village site or grave certain harpoon parts are found, will a comparison with the drawings or descriptions in this paper tell who the makers of these relics might have been? In the first place, if the technical products of peoples now living are to throw light upon ethnic and archæologic investigations, these products must be collected in large numbers and the identity of those who made and used them must be settled beyond controversy. With reference to precious material gathered after the discovery and scattered in private and public collections, it is safe to label them as to tribe and locality by the help of specimens lately acquired by scientific collectors. In this way the mouths of these dumb witnesses will be opened. It must not be forgotten, however, that unity of race is a matter of blood, of kinship; that unity of speech is a matter of lip and ear, and requires some close contact; while unity of industry is a matter of eye and hand and may be easily communicated from afar.

On the question, how much of all this invention is of native growth and what proportion is exotic, wide differences of opinion still exist.

To begin with, all iron and all work of iron are in a sense new, added, accultural; not out and out, but in varying proportion and for the most part merely substitutional. The iron blade takes the place of a stone blade only as a better stone. It is hammered and ground similarly. The simple tools alter shapes but little; they merely cut, saw, grind, and pierce better than the old. But a more vigorous substitution took place in the barter of devices between savage tribes widely separated, but made acquainted, first in their own commerce, and afterwards by the fishing and fur trading interests of the white settlers.



BARBED HARPOON WITH FLOAT, KADIAK, ALASKA.
Collected by Vincent Collyer.
Cat. No. 11362. U.S.N.M.